US009436420B2

(12) **United States Patent**
Motoyama et al.

(10) **Patent No.: US 9,436,420 B2**
(45) **Date of Patent: *Sep. 6, 2016**

(54) **METHOD AND SYSTEM FOR REMOTE DIAGNOSTIC, CONTROL AND INFORMATION COLLECTION BASED ON VARIOUS COMMUNICATION MODES FOR SENDING MESSAGES TO USERS**

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(72) Inventors: **Tetsuro Motoyama**, Cupertino, CA (US); **Masaichi Niro**, Kawasaki (JP)

(73) Assignee: **RICOH COMPANY, LTD.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/628,655**

(22) Filed: **Feb. 23, 2015**

(65) **Prior Publication Data**

US 2015/0160905 A1 Jun. 11, 2015

Related U.S. Application Data

(63) Continuation of application No. 13/846,329, filed on Mar. 18, 2013, now Pat. No. 9,015,261, which is a continuation of application No. 13/446,433, filed on Apr. 13, 2012, now Pat. No. 8,429,271, which is a

(Continued)

(51) **Int. Cl.**
G06F 3/12 (2006.01)
G06F 11/22 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G06F 3/1273*** (2013.01); ***G03G 15/5079*** (2013.01); ***G06F 3/1207*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04L 43/08; G06F 3/1259
USPC 709/206, 217, 219, 223, 224
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,402,527 A * 3/1995 Bigby G06F 3/1204 358/1.1
5,412,779 A 5/1995 Motoyama
(Continued)

FOREIGN PATENT DOCUMENTS

JP 6-187172 7/1994
JP 7-110791 4/1995
(Continued)

OTHER PUBLICATIONS

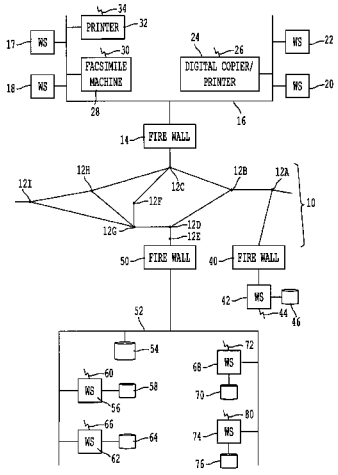
U.S. Appl. No. 07/549,278, filed Jul. 6, 1990, Motoyama.
(Continued)

Primary Examiner — Viet Vu
(74) *Attorney, Agent, or Firm* — Oblon, McClelland, Maier & Neustadt, L.L.P.

(57) **ABSTRACT**

A method, system, and program product for communicating with machines and end users connected to a network. Information sent to or from the machines is transmitted using electronic mail or a via a direct connection. The electronic mail may be transmitted over the Internet to a service center or from a service center to a resource administrator, but also may remain within a local or wide area network for transmission between a machine and an end user or a resource administrator. E-mail messages may be transmitted from a computer which is attached to a device which is being monitored or controlled and include information regarding the status, usage or capabilities of the attached device. The device may send status messages and usage information of the device by an end user to either a resource administrator or to a service center on the Internet through a firewall.

13 Claims, 34 Drawing Sheets



Related U.S. Application Data

continuation of application No. 13/090,849, filed on Apr. 20, 2011, now Pat. No. 8,161,153, which is a continuation of application No. 12/715,116, filed on Mar. 1, 2010, now Pat. No. 7,958,236, which is a continuation of application No. 12/028,281, filed on Feb. 8, 2008, now Pat. No. 7,689,691, which is a continuation of application No. 11/390,198, filed on Mar. 28, 2006, now Pat. No. 7,353,273, which is a continuation of application No. 10/784,831, filed on Feb. 24, 2004, now Pat. No. 7,043,551, which is a continuation of application No. 10/423,983, filed on Apr. 28, 2003, now Pat. No. 6,714,971, which is a continuation of application No. 09/407,769, filed on Sep. 29, 1999, now Pat. No. 6,581,092.

(51) **Int. Cl.**

G06Q 10/06	(2012.01)
G06Q 10/10	(2012.01)
H04N 1/00	(2006.01)
H04N 1/032	(2006.01)
H04N 1/32	(2006.01)
H04L 12/26	(2006.01)
G03G 15/00	(2006.01)
H04L 12/58	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F3/1219*** (2013.01); ***G06F 11/2294*** (2013.01); ***G06Q 10/06*** (2013.01); ***G06Q 10/107*** (2013.01); ***H04L 43/08*** (2013.01); ***H04N 1/00209*** (2013.01); ***H04N 1/0323*** (2013.01); ***H04N 1/32021*** (2013.01); *H04L 12/58* (2013.01); *H04N 2201/0017* (2013.01); *H04N 2201/3202* (2013.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,537,550	A	7/1996	Russell et al.
5,537,554	A	7/1996	Motoyama
5,544,289	A	8/1996	Motoyama
5,568,618	A	10/1996	Motoyama
5,580,177	A	12/1996	Gase et al.
5,649,120	A	7/1997	Motoyama
5,682,140	A	10/1997	Christensen et al.
5,752,697	A	5/1998	Mandel et al.
5,768,483	A	6/1998	Maniwa et al.
5,774,678	A	6/1998	Motoyama
5,778,183	A	7/1998	Filion et al.
5,818,603	A	10/1998	Motoyama
5,819,110	A	10/1998	Motoyama
5,828,830	A	10/1998	Rangaraian et al.
5,828,863	A	10/1998	Barrett et al.
5,887,216	A	3/1999	Motoyama
5,908,493	A	6/1999	Krymsky
5,909,493	A	6/1999	Motoyama
5,936,655	A	8/1999	Biedermann
5,956,698	A	9/1999	Lacheze et al.
5,987,225	A	11/1999	Okano
5,995,774	A	11/1999	Applegate et al.
6,003,070	A	12/1999	Frantz
6,025,925	A	2/2000	Davidson et al.
6,031,623	A	2/2000	Smith et al.
6,085,196	A	7/2000	Motoyama et al.
6,101,531	A	8/2000	Eggleston et al.
6,108,099	A	8/2000	Ohtani
6,216,113	B1	4/2001	Alkens et al.
6,219,151	B1	4/2001	Manglapus et al.
6,240,456	B1	5/2001	Teng et al.
6,275,299	B1	8/2001	Beck
6,279,015	B1	8/2001	Fong et al.
6,279,034	B1	8/2001	Jarriel et al.
6,317,848	B1	11/2001	Sorens et al.
6,330,628	B1	12/2001	Motoyama
6,377,939	B1	4/2002	Young
6,452,692	B1	9/2002	Yacoub
6,473,812	B2	10/2002	Motoyama
6,486,968	B2	11/2002	Nishikawa
6,581,092	B1	6/2003	Motoyama et al.
6,631,247	B1	10/2003	Motoyama et al.
6,657,740	B1	12/2003	Emminizer
6,714,971	B2	3/2004	Motoyama et al.
6,801,331	B1	10/2004	Motoyama
6,889,263	B2	5/2005	Motoyama
6,928,493	B2	8/2005	Motoyama
6,952,726	B1	10/2005	White et al.
6,970,952	B2	11/2005	Motoyama
7,043,551	B2	5/2006	Motoyama et al.
7,053,767	B2	5/2006	Petite et al.
7,120,707	B2	10/2006	Motoyama
7,131,070	B1	10/2006	Motoyama et al.
7,185,080	B1	2/2007	Motoyama
7,194,560	B2	3/2007	Motoyama
7,293,081	B2	11/2007	Motoyama et al.
7,353,273	B2	4/2008	Motoyama et al.
7,383,359	B2	6/2008	Motoyama et al.
7,421,496	B2	9/2008	Motoyama
7,428,575	B1	9/2008	Motoyama
7,447,809	B2	11/2008	Motoyama
7,451,247	B2	11/2008	Motoyama
7,457,889	B2	11/2008	Motoyama
7,480,249	B2	1/2009	Motoyama
7,495,787	B1	2/2009	Motoyama
7,509,380	B2	3/2009	Motoyama
7,516,193	B2	4/2009	Motoyama et al.
7,574,654	B2	8/2009	Motoyama et al.
7,620,717	B2	11/2009	Motoyama et al.
7,620,744	B2	11/2009	Motoyama
7,689,691	B2	3/2010	Motoyama et al.
7,801,977	B2	9/2010	Motoyama et al.
7,921,232	B2	4/2011	Motoyama
7,945,700	B2	5/2011	Motoyama et al.
7,958,236	B2	6/2011	Motoyama et al.
8,135,817	B2	3/2012	Motoyama
8,161,153	B2	4/2012	Motoyama et al.
8,429,271	B2	4/2013	Motoyama et al.
8,676,957	B2	3/2014	Motoyama
8,949,417	B2	2/2015	Motoyama
9,015,261	B2	4/2015	Motoyama et al.
2002/0004812	A1	1/2002	Motoyama
2002/0007390	A1	1/2002	Motoyama
2002/0101604	A1	8/2002	Mima et al.
2003/0093522	A1	5/2003	Motoyama
2003/0137685	A1	7/2003	Meade et al.
2005/0256934	A1	11/2005	Motoyama
2007/0033266	A1	2/2007	Motoyama et al.

FOREIGN PATENT DOCUMENTS

JP	10-143451	5/1998
JP	10-240639	9/1998
JP	11-102303	4/1999

OTHER PUBLICATIONS

Office Action issued Jan. 10, 2010, in Japan Patent Application No. 2007-154470.

Xerox Corporation New Release entitled "New Xerox Color Laser Printer Taps Internet for Remote Color Printing", May 10, 1999, 3 pages.

* cited by examiner

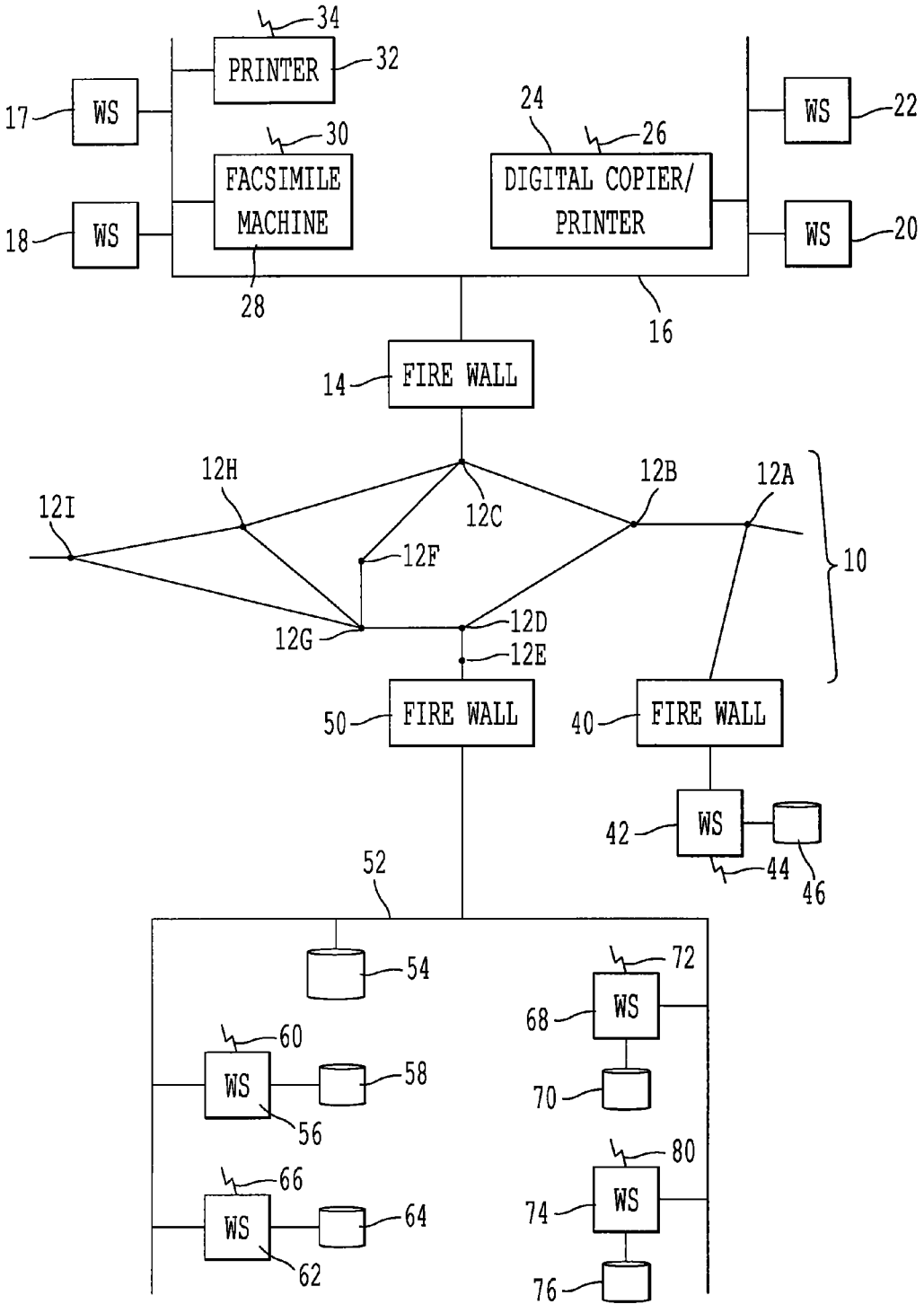
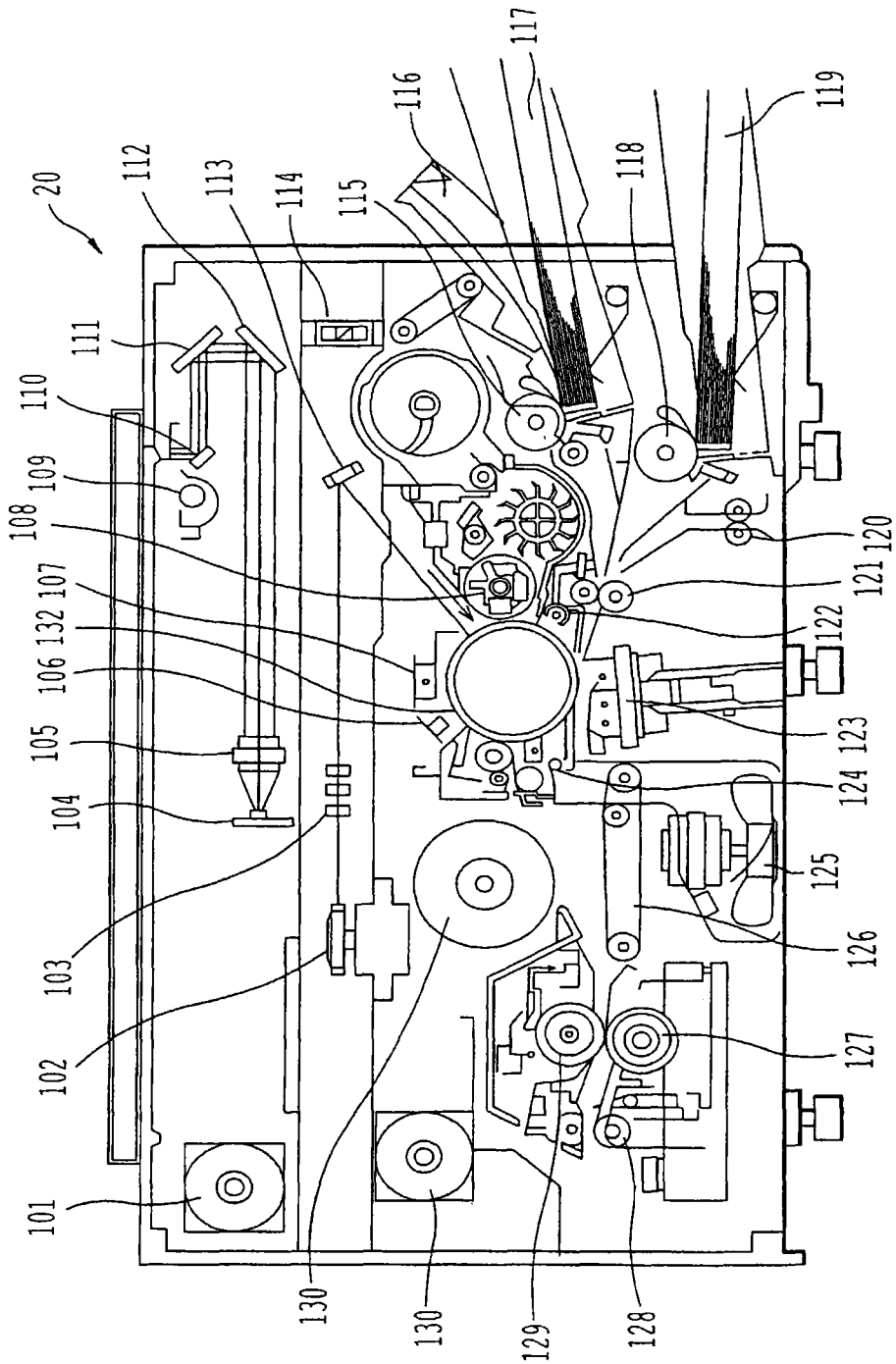

34
PRINTER
32
17
WS
30
FACSIMILE MACHINE
18
WS
28
24
26
DIGITAL COPIER/ PRINTER
WS
22
WS
20
16
14
FIRE WALL
12H
12I
12C
12B
12A
12F
10
12G
12D
12E
50
FIRE WALL
40
FIRE WALL
42
WS
44
46
52
54
72
68
WS
60
WS
58
70
56
80
66
WS
74
WS
64
62
76

FIG. 1


20
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
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117
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119
120
121
122
123
124
125
126
127
128
129
130
130
132

FIG. 2

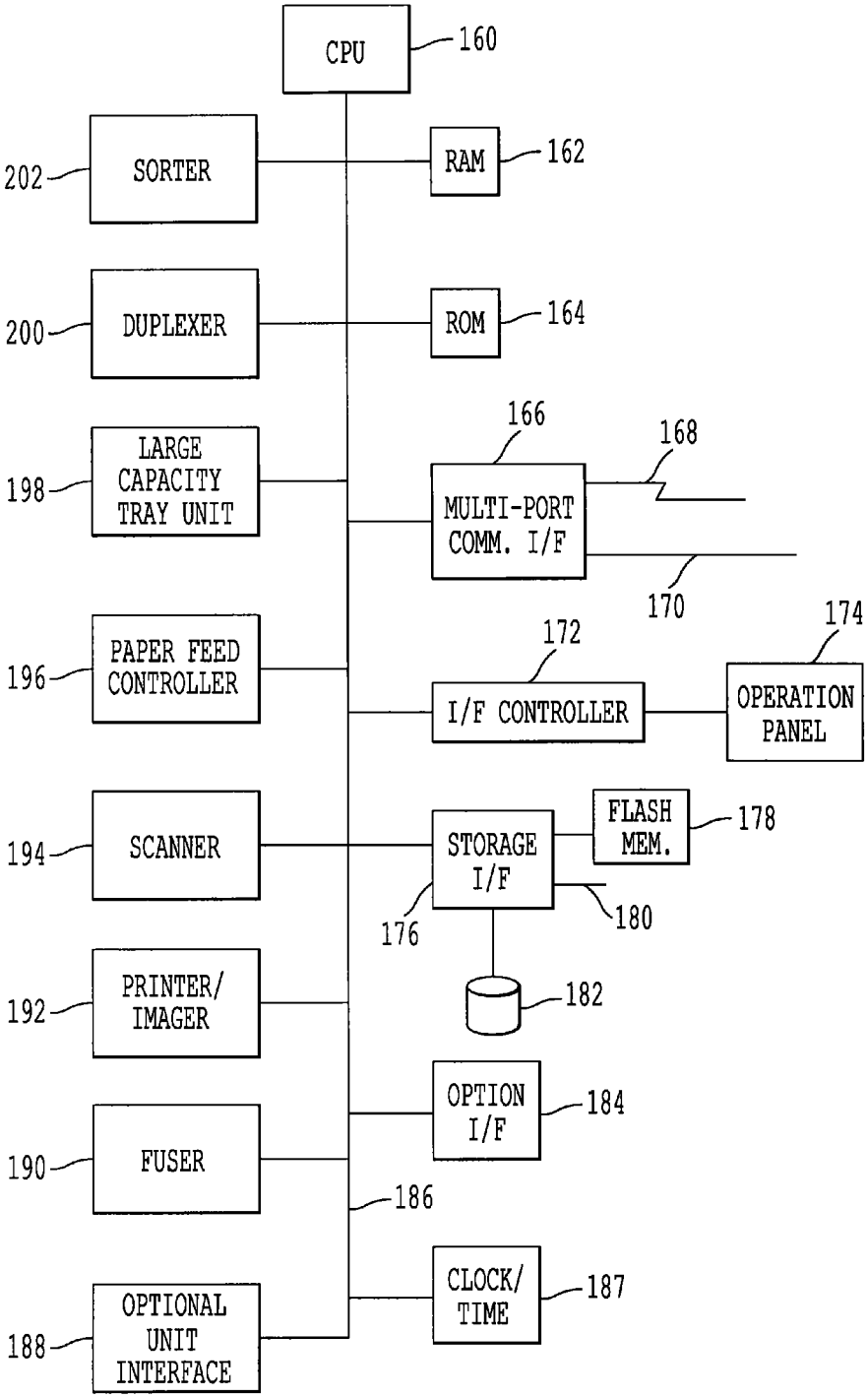
CPU
160
SORTER
202
RAM
162
DUPLEXER
200
ROM
164
LARGE CAPACITY TRAY UNIT
198
166
168
MULTI-PORT COMM. I/F
170
PAPER FEED CONTROLLER
196
172
174
I/F CONTROLLER
OPERATION PANEL
SCANNER
194
FLASH MEM.
178
STORAGE I/F
176
180
182
PRINTER/ IMAGER
192
OPTION I/F
184
FUSER
190
186
CLOCK/ TIME
187
OPTIONAL UNIT INTERFACE
188

FIG. 3

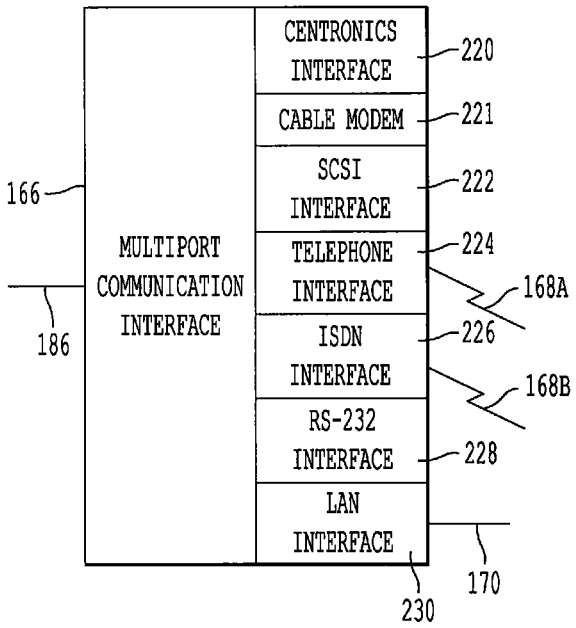
MULTIPORT COMMUNICATION INTERFACE
166
186
CENTRONICS INTERFACE
220
CABLE MODEM
221
SCSI INTERFACE
222
TELEPHONE INTERFACE
224
168A
ISDN INTERFACE
226
168B
RS-232 INTERFACE
228
LAN INTERFACE
230
170

FIG. 4

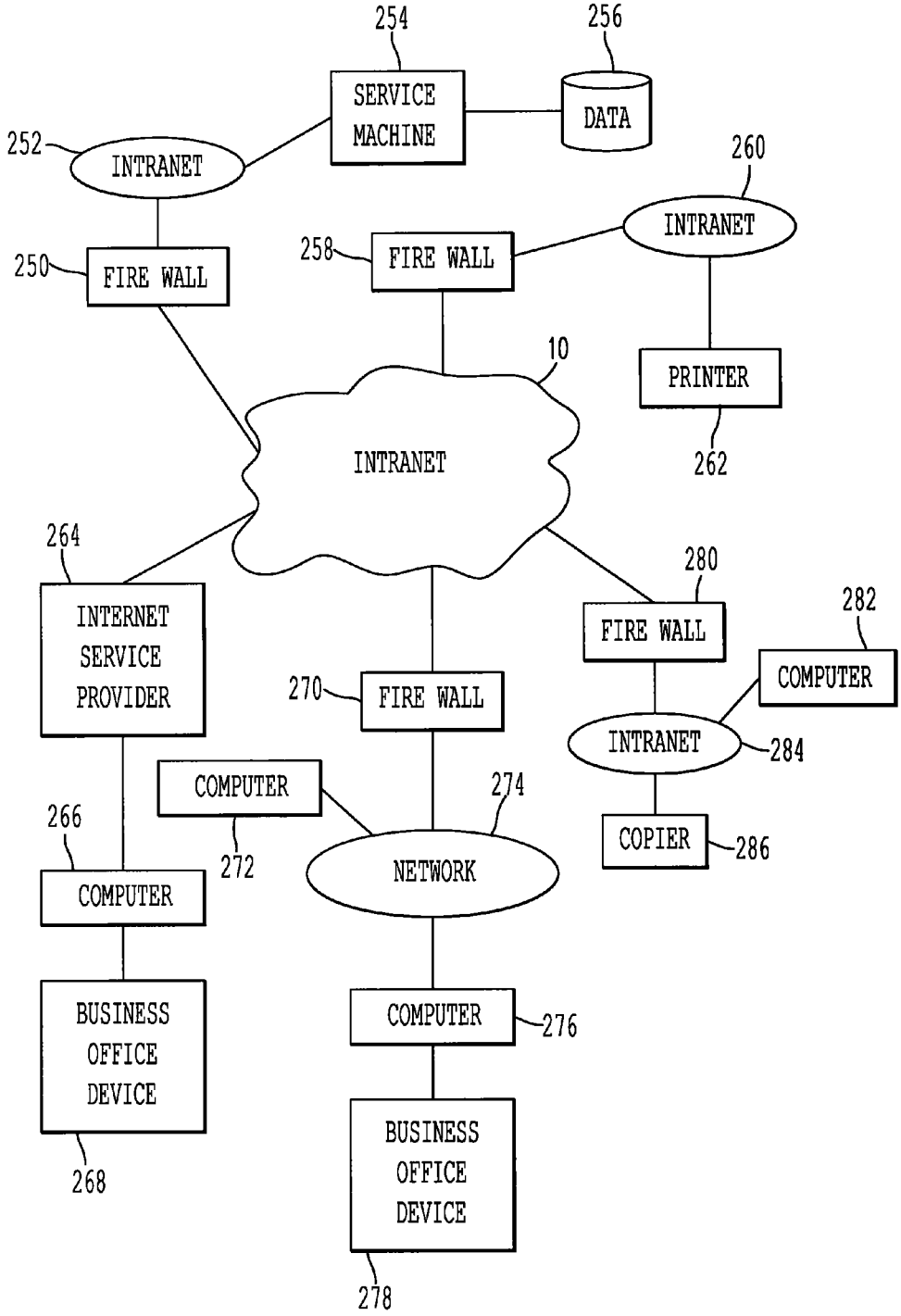
254
256
SERVICE MACHINE
DATA
252
INTRANET
260
INTRANET
250
FIRE WALL
258
FIRE WALL
10
PRINTER
INTRANET
262
264
280
282
INTERNET SERVICE PROVIDER
FIRE WALL
COMPUTER
270
FIRE WALL
INTRANET
284
COMPUTER
274
266
COPIER
286
272
NETWORK
COMPUTER
BUSINESS OFFICE DEVICE
COMPUTER
276
BUSINESS OFFICE DEVICE
268
278

FIG. 5

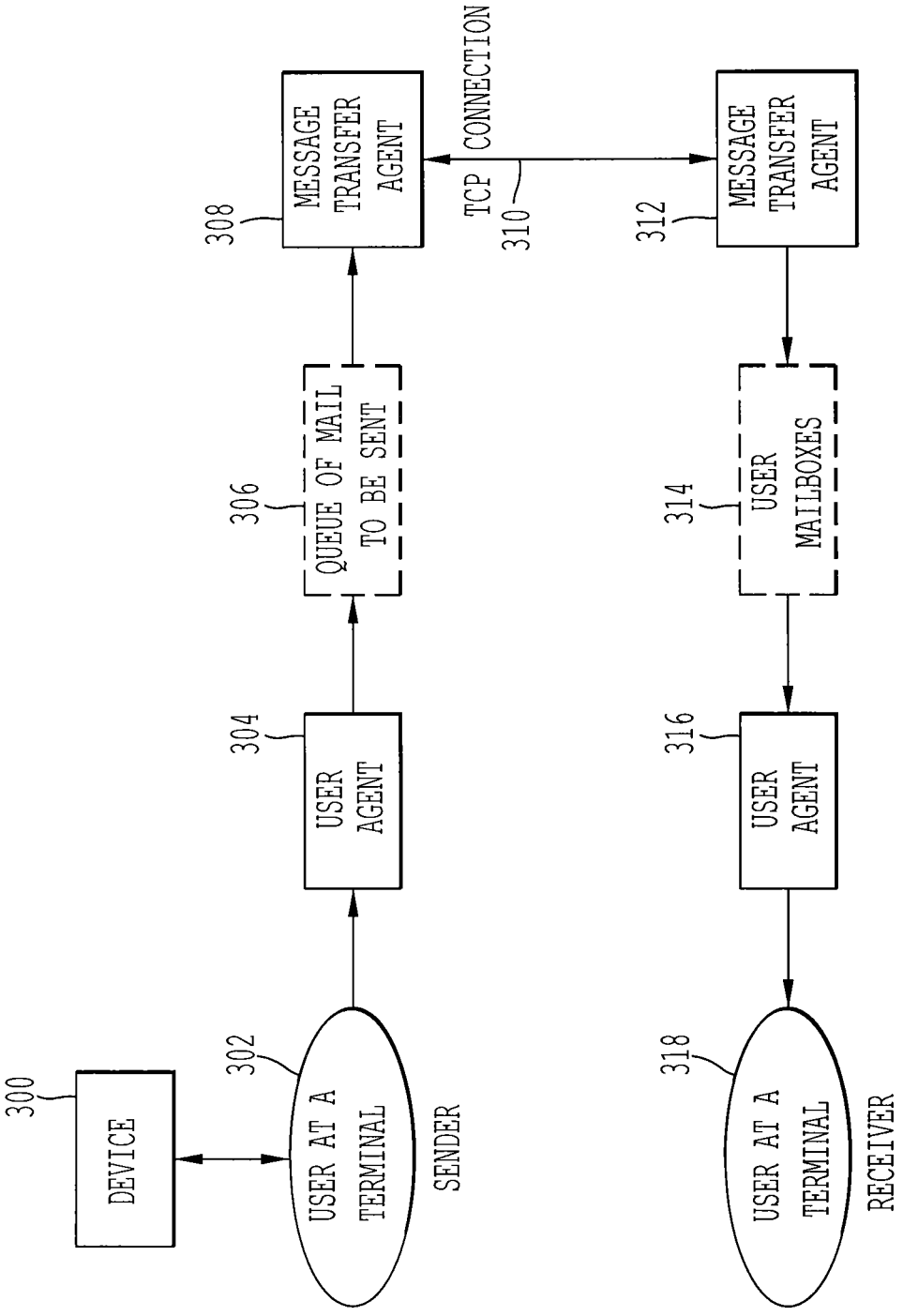
300
DEVICE
302
USER AT A TERMINAL
SENDER
304
USER AGENT
306
QUEUE OF MAIL TO BE SENT
308
MESSAGE TRANSFER AGENT
TCP CONNECTION
310
312
MESSAGE TRANSFER AGENT
314
USER MAILBOXES
316
USER AGENT
318
USER AT A TERMINAL
RECEIVER

FIG. 6A

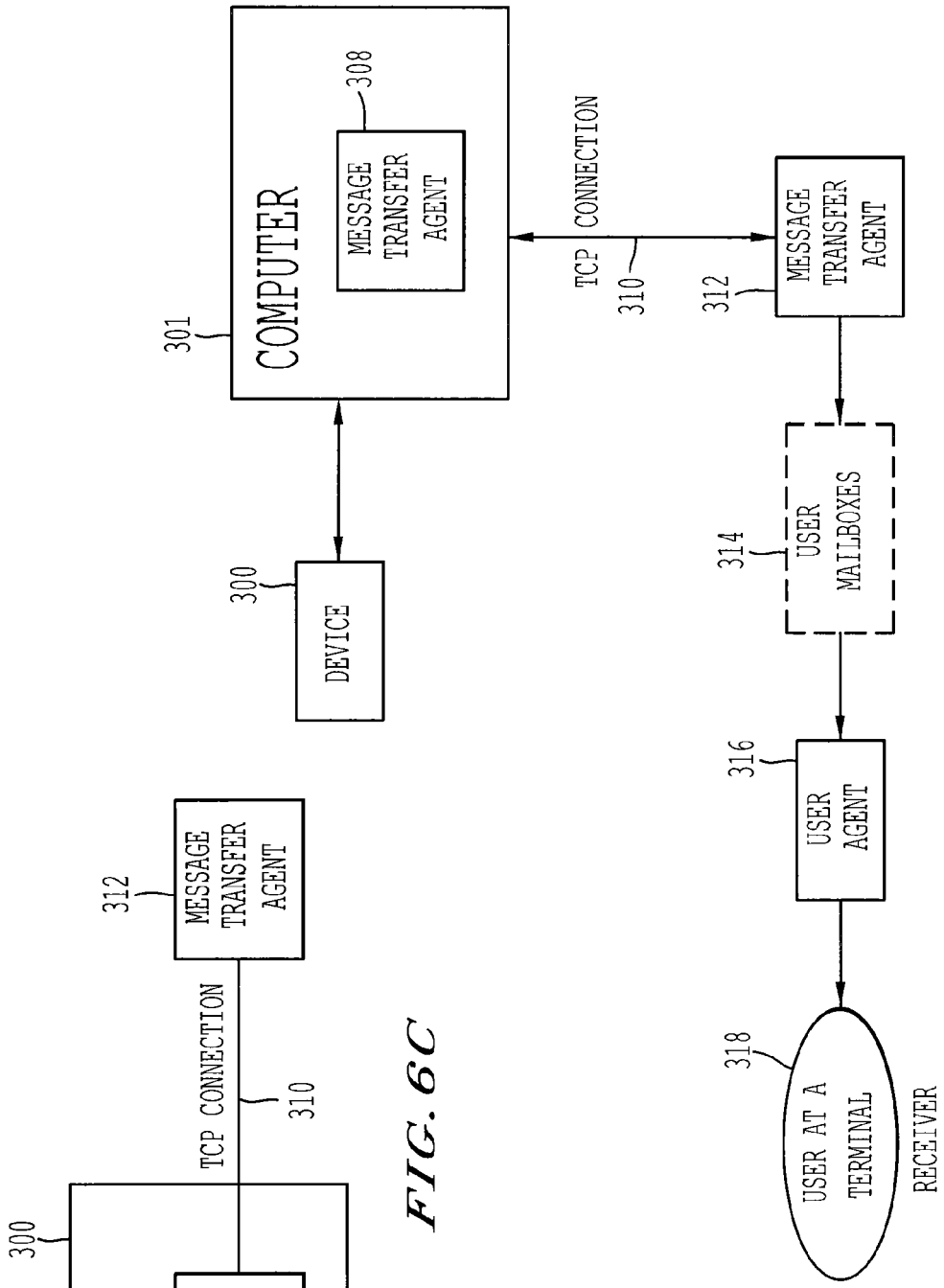
COMPUTER
301
MESSAGE TRANSFER AGENT
308
DEVICE
300
TCP CONNECTION
310
MESSAGE TRANSFER AGENT
312
USER MAILBOXES
314
USER AGENT
316
USER AT A TERMINAL
318
RECEIVER
DEVICE
300
MESSAGE TRANSFER AGENT
308
TCP CONNECTION
310
MESSAGE TRANSFER AGENT
312

FIG. 6B

FIG. 6C

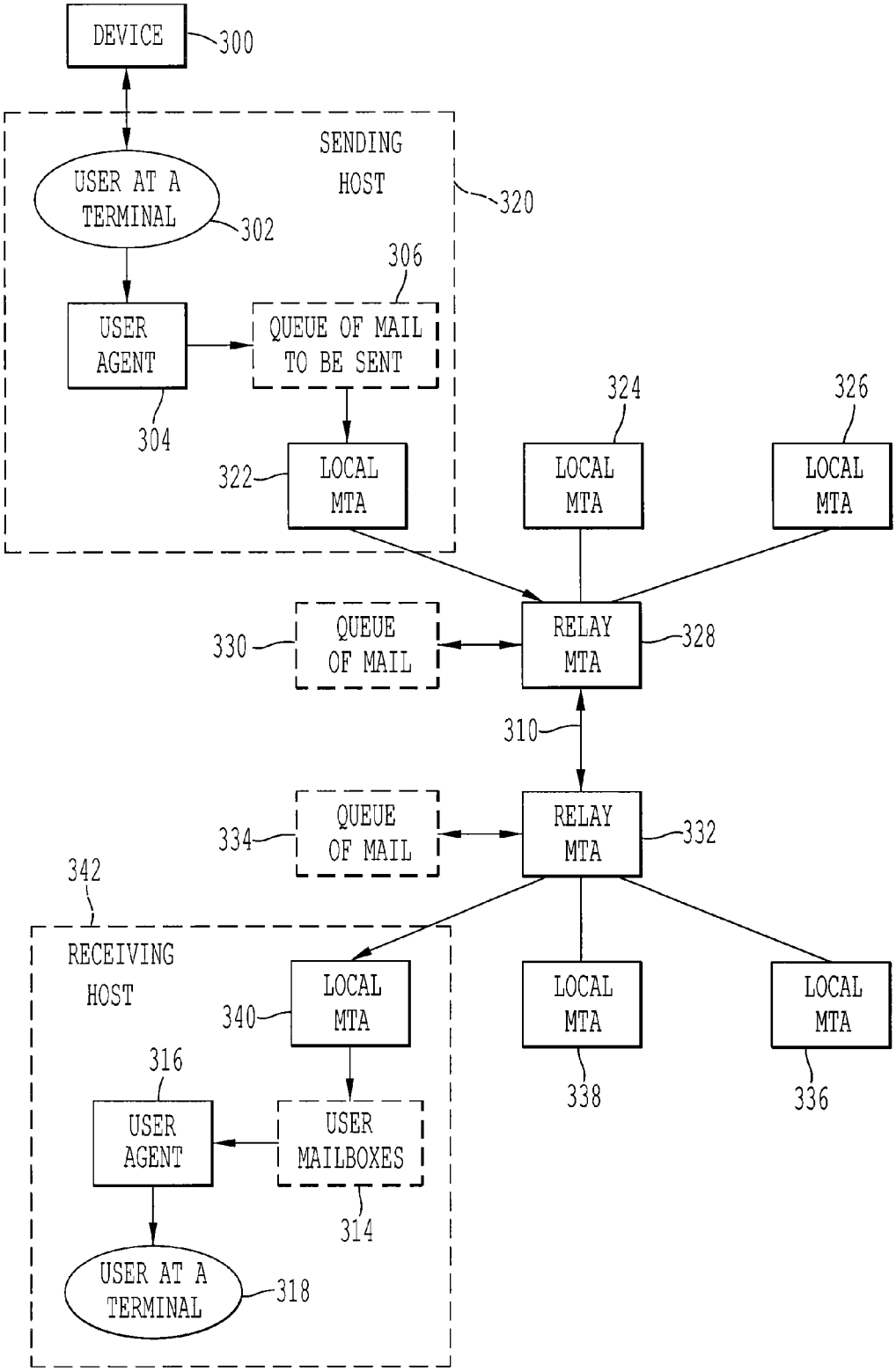
DEVICE
300
SENDING HOST
320
USER AT A TERMINAL
302
306
USER AGENT
QUEUE OF MAIL TO BE SENT
304
322
LOCAL MTA
324
LOCAL MTA
326
LOCAL MTA
330
QUEUE OF MAIL
RELAY MTA
328
310
334
QUEUE OF MAIL
RELAY MTA
332
342
RECEIVING HOST
340
LOCAL MTA
LOCAL MTA
LOCAL MTA
316
USER AGENT
USER MAILBOXES
314
338
336
USER AT A TERMINAL
318

FIG. 7

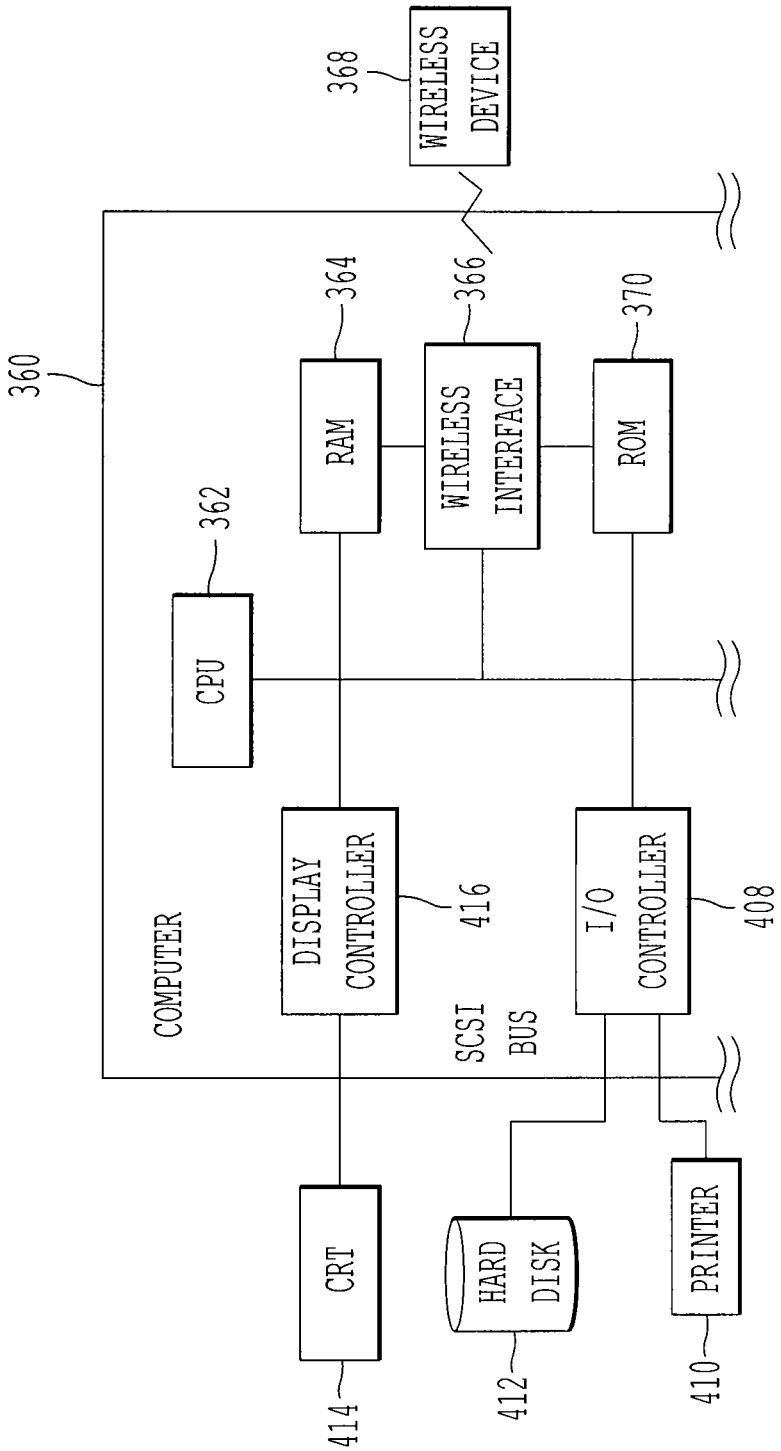
368
WIRELESS DEVICE
366
364
370
360
RAM
WIRELESS INTERFACE
ROM
362
CPU
DISPLAY CONTROLLER
416
I/O CONTROLLER
408
COMPUTER
SCSI BUS
CRT
HARD DISK
PRINTER
414
412
410

FIG. 8A

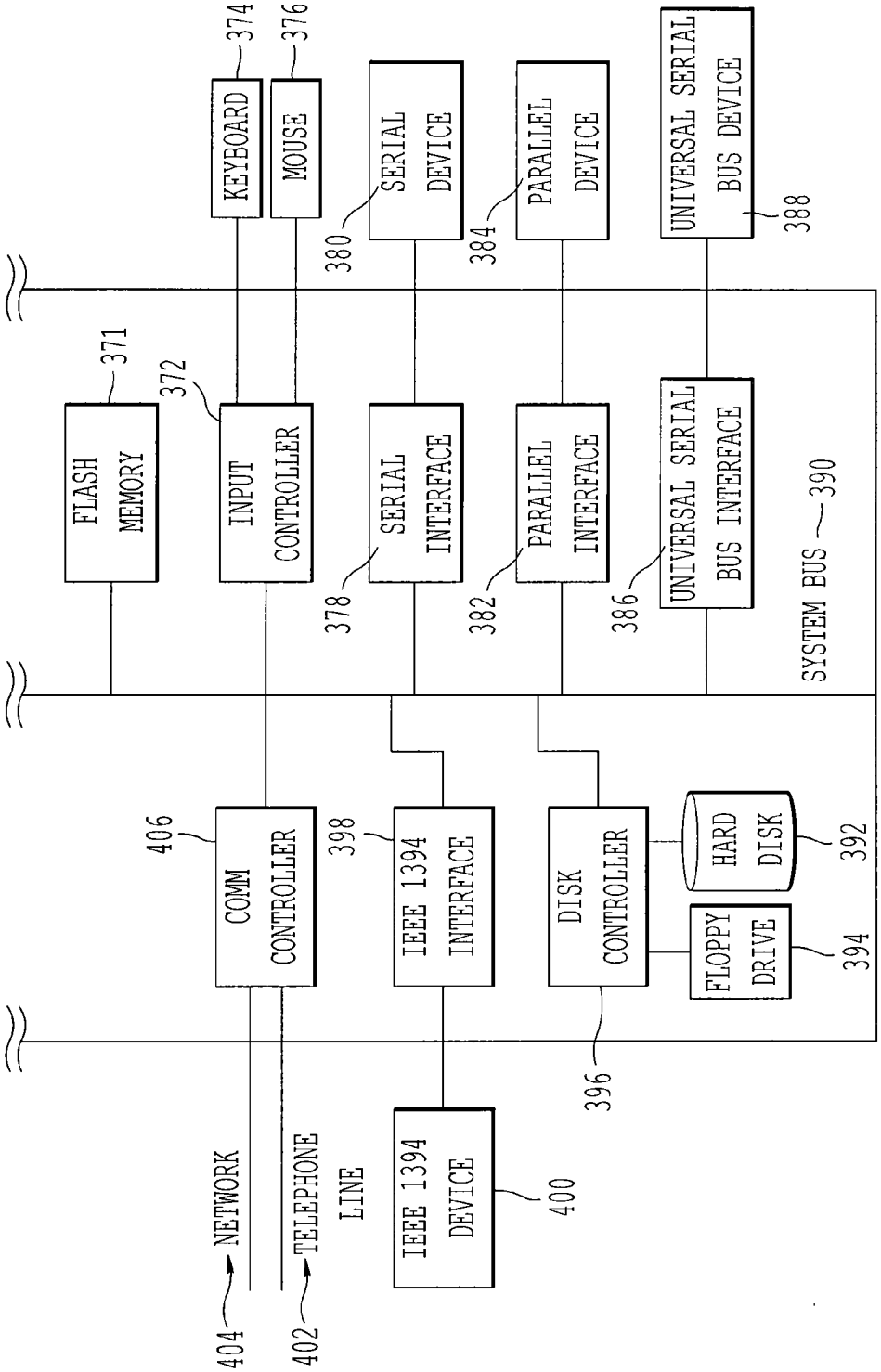
KEYBOARD
374
MOUSE
376
SERIAL DEVICE
380
PARALLEL DEVICE
384
UNIVERSAL SERIAL BUS DEVICE
388
FLASH MEMORY
371
INPUT CONTROLLER
372
SERIAL INTERFACE
378
PARALLEL INTERFACE
382
UNIVERSAL SERIAL BUS INTERFACE
386
SYSTEM BUS
390
COMM CONTROLLER
406
IEEE 1394 INTERFACE
398
DISK CONTROLLER
HARD DISK
392
FLOPPY DRIVE
394
396
IEEE 1394 DEVICE
400
NETWORK
404
TELEPHONE LINE
402

FIG. 8B

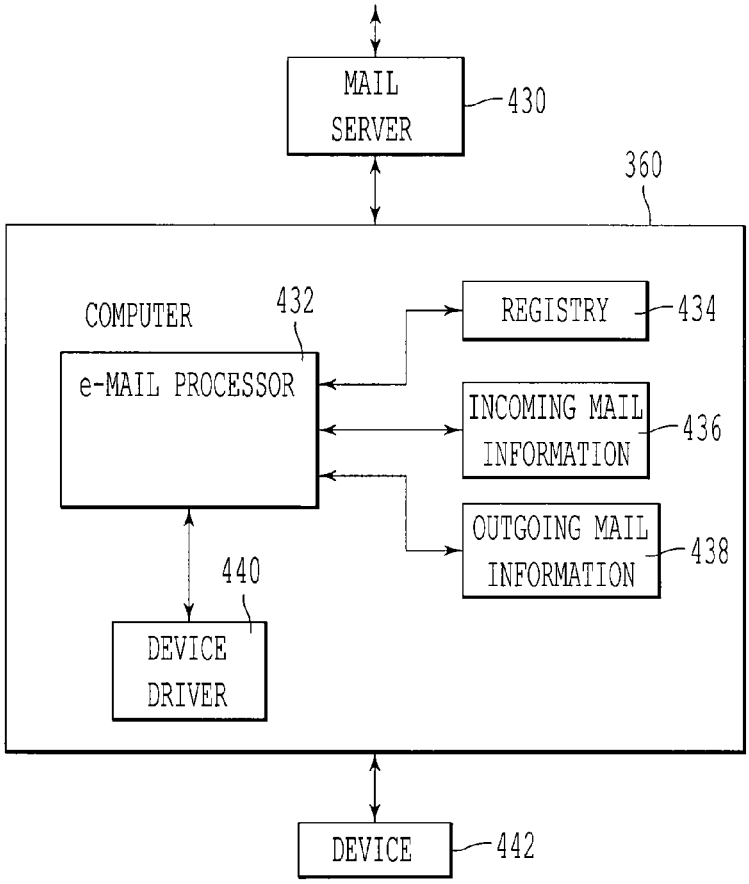
MAIL SERVER
430
360
COMPUTER
432
e-MAIL PROCESSOR
REGISTRY
434
INCOMING MAIL INFORMATION
436
OUTGOING MAIL INFORMATION
438
440
DEVICE DRIVER
DEVICE
442

FIG. 9

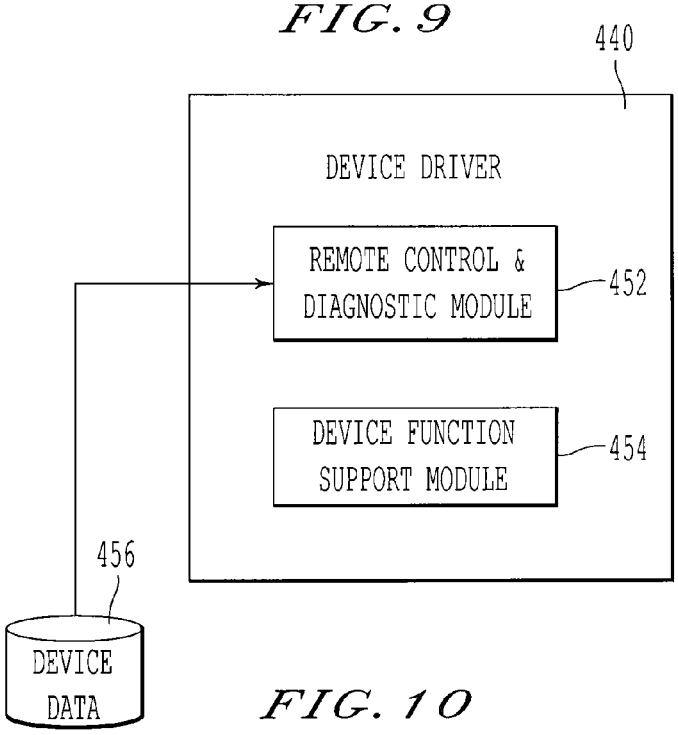
440
DEVICE DRIVER
REMOTE CONTROL & DIAGNOSTIC MODULE
452
DEVICE FUNCTION SUPPORT MODULE
454
456
DEVICE DATA

FIG. 10

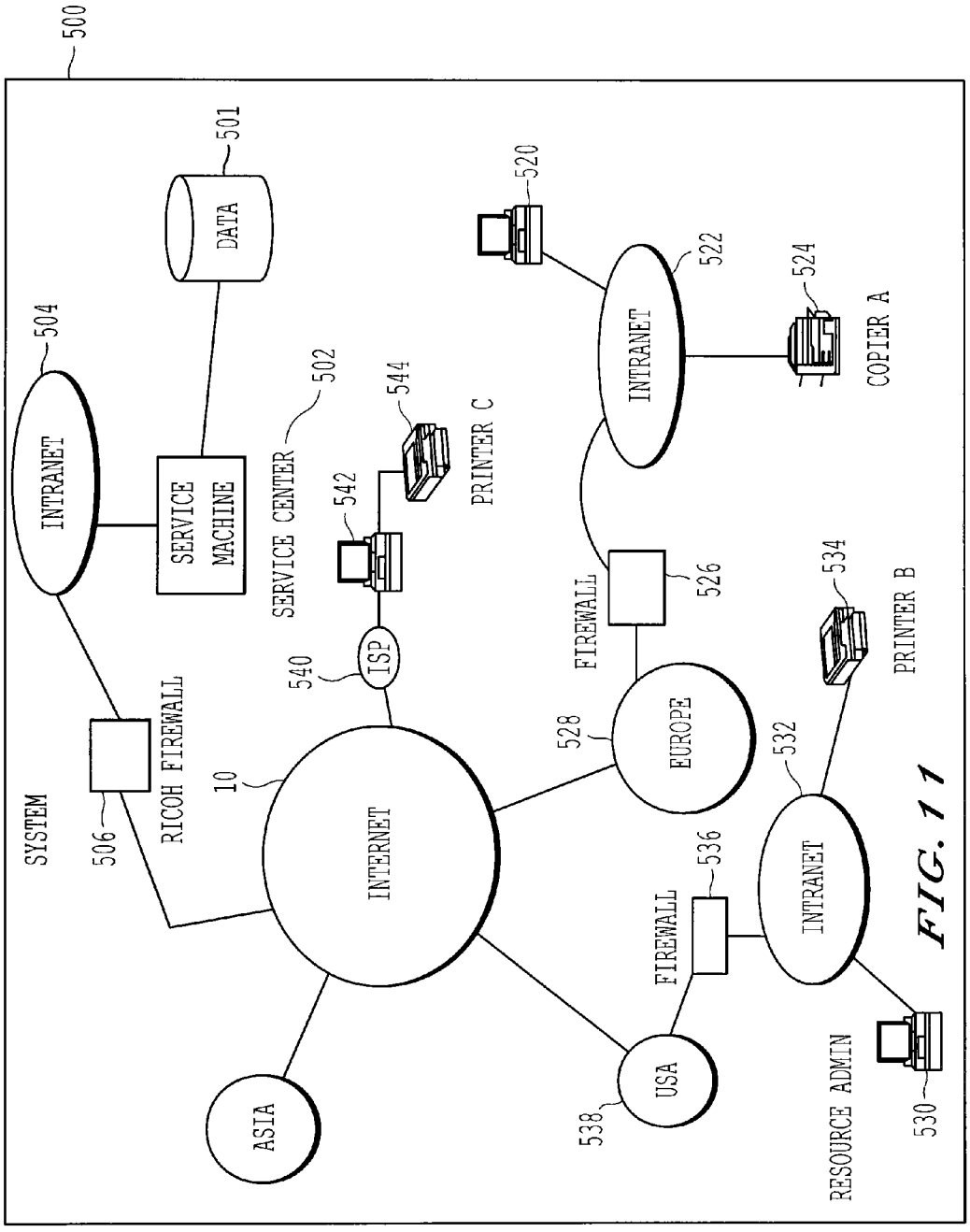
500
501
DATA
504
INTRANET
SERVICE MACHINE
502
SERVICE CENTER
544
PRINTER C
542
520
522
INTRANET
524
COPIER A
SYSTEM
506
RICOH FIREWALL
10
540
ISP
INTERNET
FIREWALL
526
528
EUROPE
534
PRINTER B
532
INTRANET
FIREWALL
536
ASIA
538
USA
RESOURCE ADMIN
530

FIG. 11

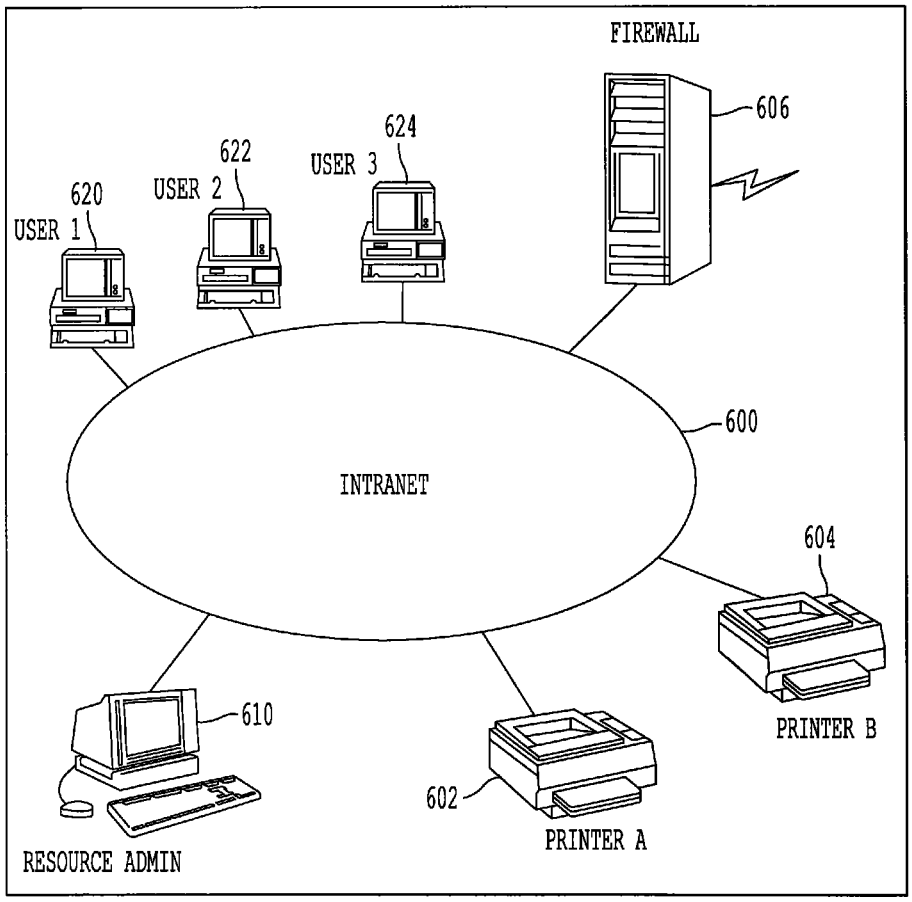
FIREWALL
606
624
622
USER 3
620
USER 2
USER 1
600
INTRANET
604
610
602
PRINTER B
RESOURCE ADMIN
PRINTER A

FIG. 12

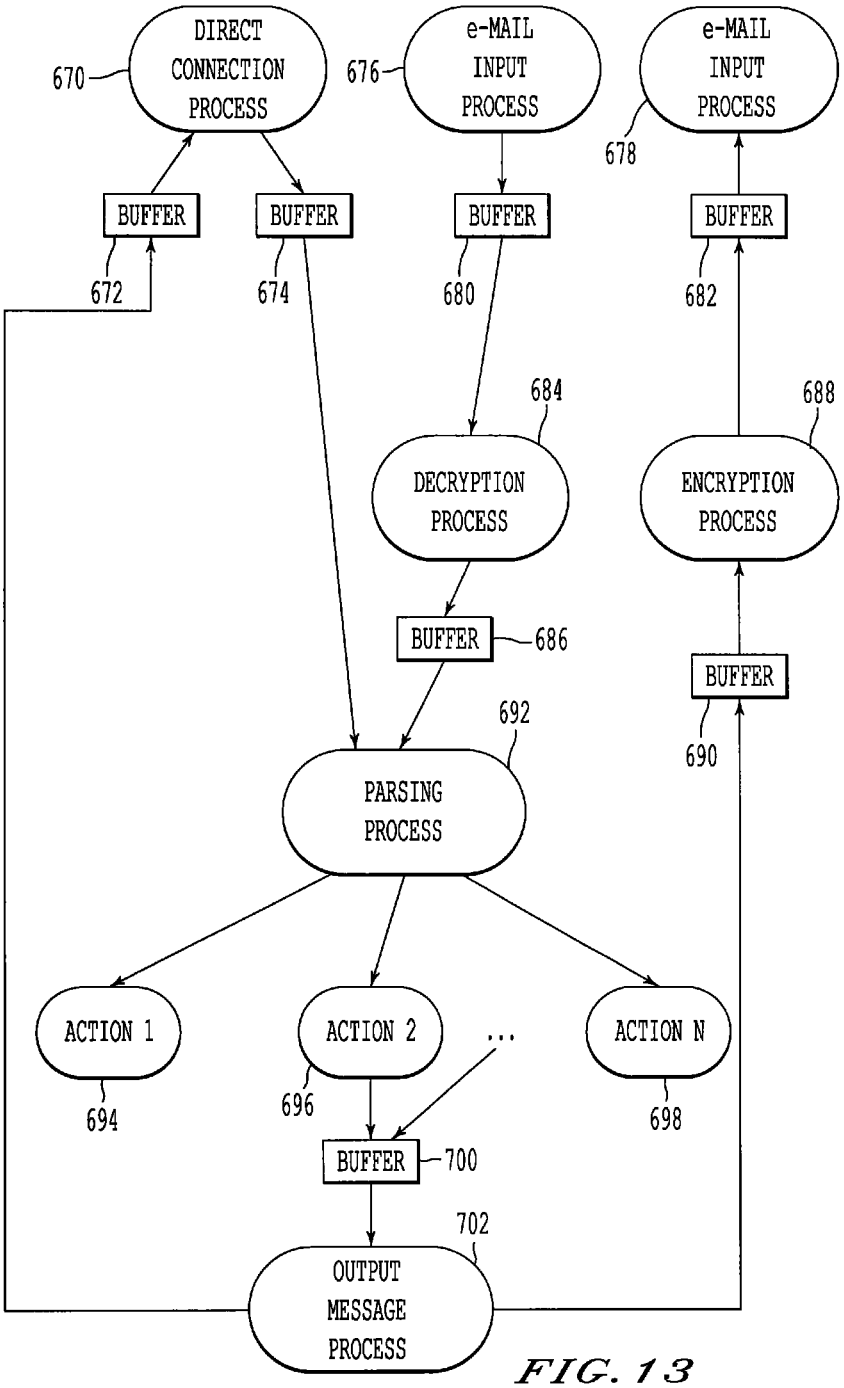
DIRECT CONNECTION PROCESS
670
e-MAIL INPUT PROCESS
676
e-MAIL INPUT PROCESS
678
BUFFER
672
BUFFER
674
BUFFER
680
BUFFER
682
684
688
DECRYPTION PROCESS
ENCRYPTION PROCESS
BUFFER
686
BUFFER
690
692
PARSING PROCESS
ACTION 1
694
ACTION 2
696
...
ACTION N
698
BUFFER
700
702
OUTPUT MESSAGE PROCESS

FIG. 13

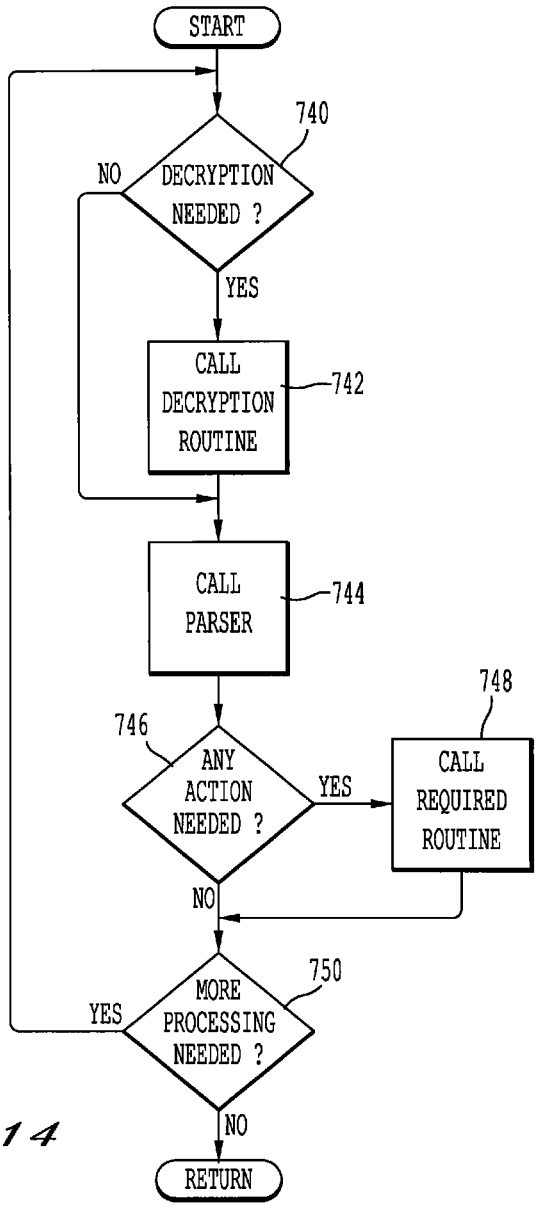
START
740
DECRYPTION NEEDED ?
NO
YES
CALL DECRYPTION ROUTINE
742
CALL PARSER
744
748
746
ANY ACTION NEEDED ?
YES
CALL REQUIRED ROUTINE
NO
750
MORE PROCESSING NEEDED ?
YES
NO
RETURN

FIG. 14

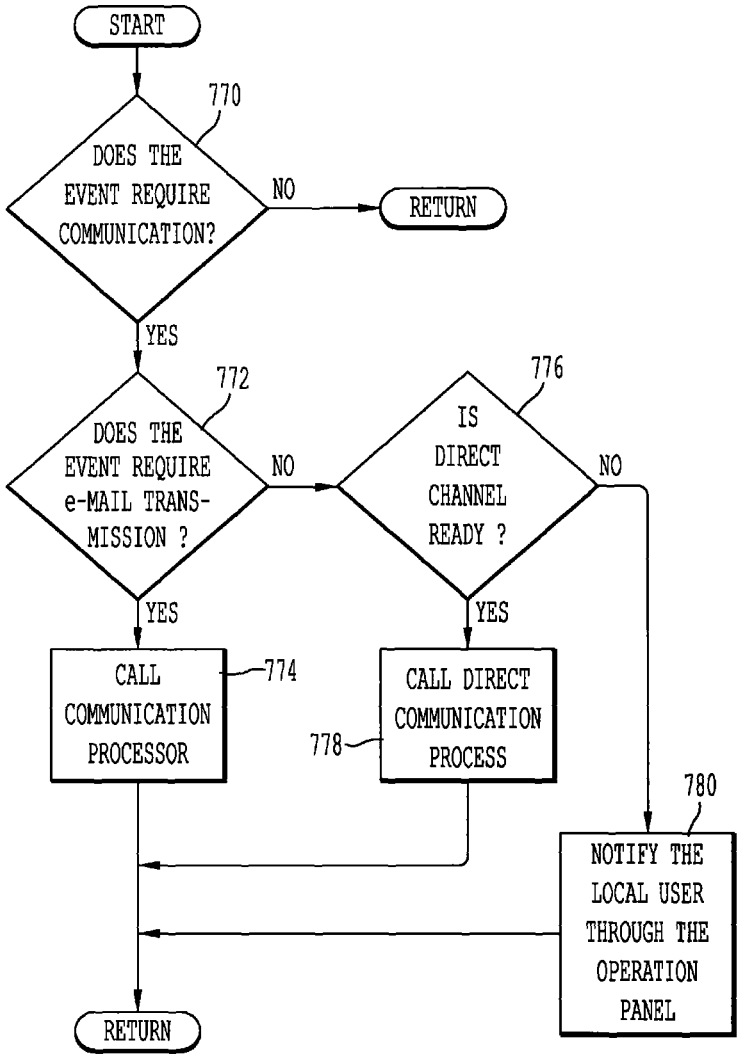
START
770
DOES THE EVENT REQUIRE COMMUNICATION?
NO
RETURN
YES
772
DOES THE EVENT REQUIRE e-MAIL TRANS-MISSION ?
NO
776
IS DIRECT CHANNEL READY ?
NO
YES
YES
CALL COMMUNICATION PROCESSOR
774
CALL DIRECT COMMUNICATION PROCESS
778
780
NOTIFY THE LOCAL USER THROUGH THE OPERATION PANEL
RETURN

FIG. 15

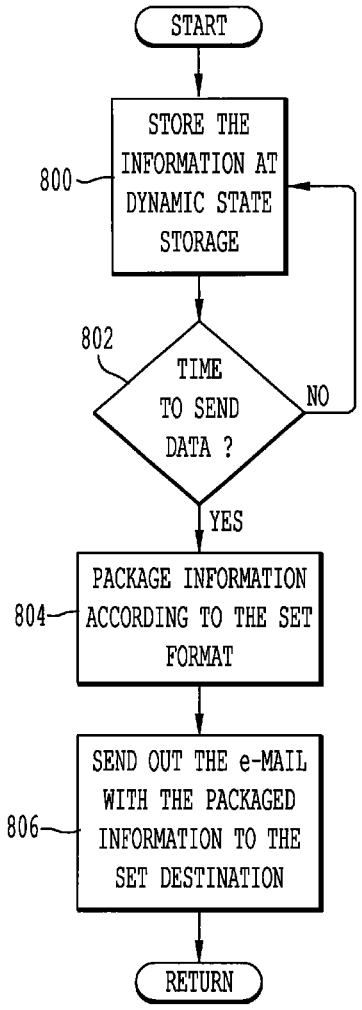
START
STORE THE INFORMATION AT DYNAMIC STATE STORAGE
800
802
TIME TO SEND DATA ?
NO
YES
PACKAGE INFORMATION ACCORDING TO THE SET FORMAT
804
SEND OUT THE e-MAIL WITH THE PACKAGED INFORMATION TO THE SET DESTINATION
806
RETURN

FIG. 16

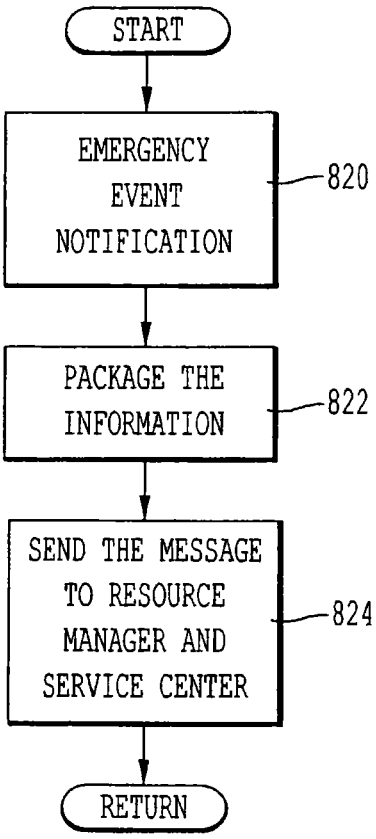
START
EMERGENCY EVENT NOTIFICATION
820
PACKAGE THE INFORMATION
822
SEND THE MESSAGE TO RESOURCE MANAGER AND SERVICE CENTER
824
RETURN

FIG. 17

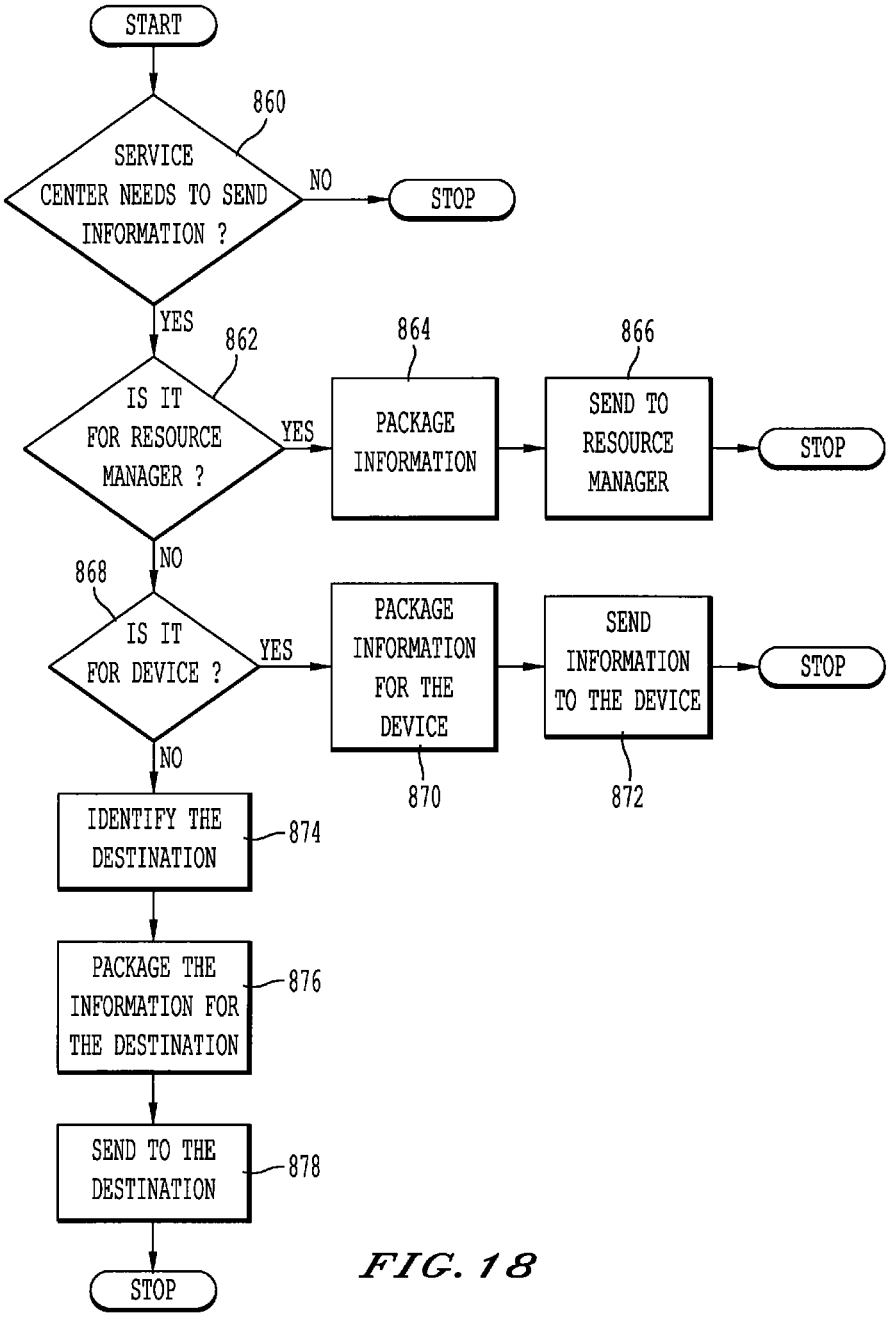
START
860
SERVICE CENTER NEEDS TO SEND INFORMATION ?
NO
STOP
YES
862
IS IT FOR RESOURCE MANAGER ?
YES
864
PACKAGE INFORMATION
866
SEND TO RESOURCE MANAGER
STOP
NO
868
IS IT FOR DEVICE ?
YES
PACKAGE INFORMATION FOR THE DEVICE
870
SEND INFORMATION TO THE DEVICE
872
STOP
NO
IDENTIFY THE DESTINATION
874
PACKAGE THE INFORMATION FOR THE DESTINATION
876
SEND TO THE DESTINATION
878
STOP

FIG. 18

```
1.  From: entity@domain_name.com Mon March 29 7:20:50  1999
2.  Date: Mon, 29 March 1999 10:18:19 - 0400
3.  From: "Service Center" <entity@domain_name.com>
4.  To: machine@office.com
5.  Subject: Printer Summary Statistics
6.  Mime-Version: 1.0
7.  Content- ...
8.
9.  Dear Customer,
10. This message has originated from your printer company.
11.
12. We would like to analyze your printer and obtain summary statistics.  Please
13. double-click on the attached executable file which will allow us to
    analyze your
14. printer and obtain summary statistics.
15.
16. Thank you for your cooperation.
17.
18. Signed, Company X
```

FIG. 19A

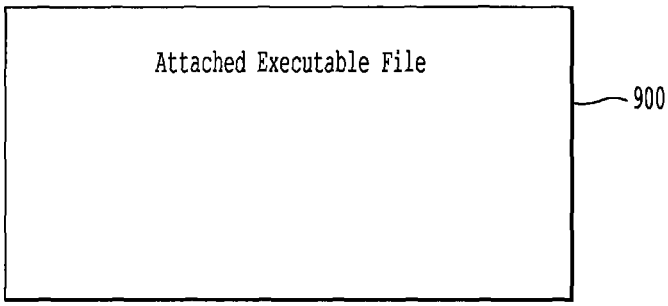

FIG. 19B

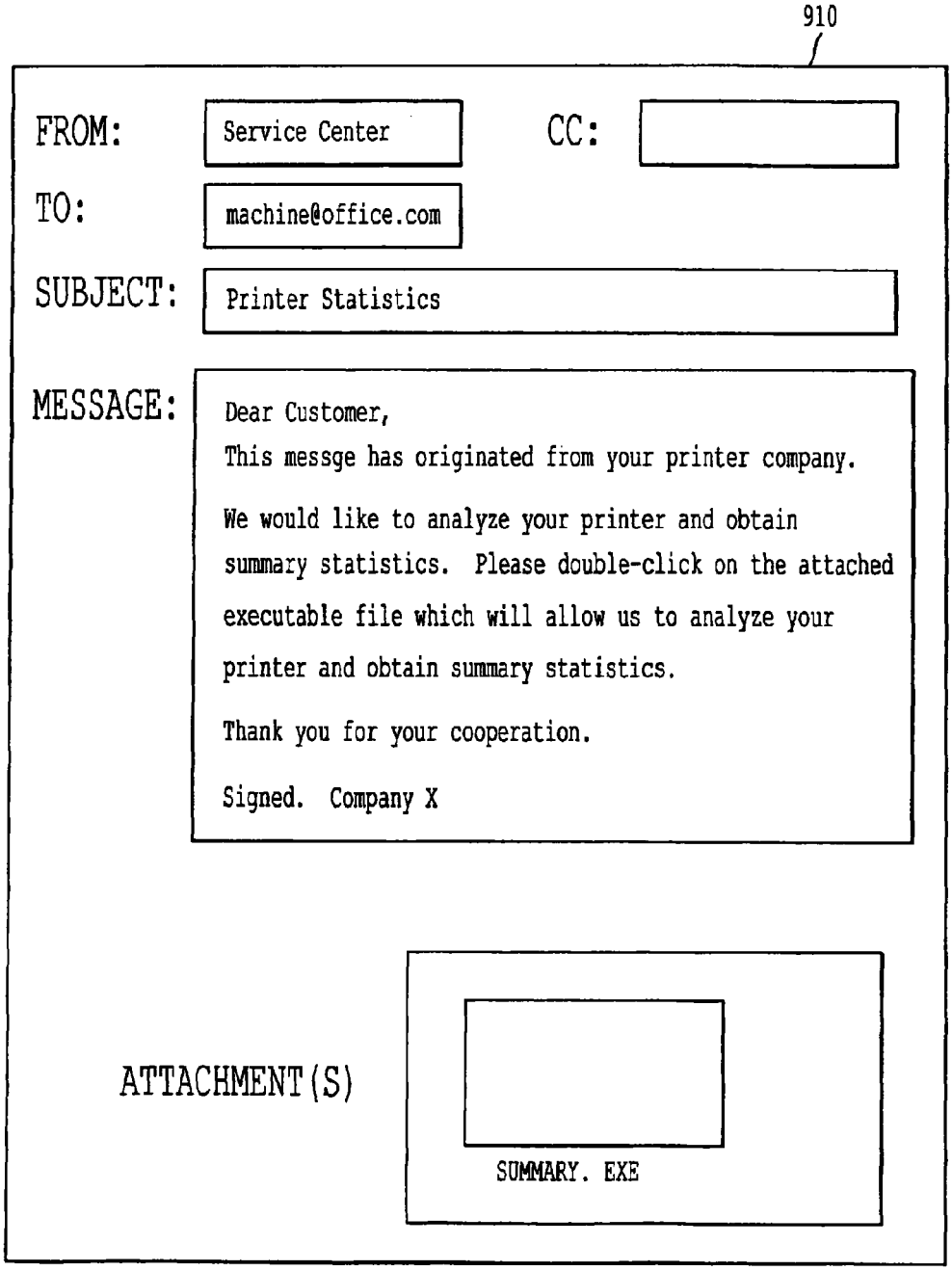
910
FROM:
Service Center
CC:
TO:
machine@office.com
SUBJECT:
Printer Statistics
MESSAGE:
Dear Customer,
This messge has originated from your printer company.
We would like to analyze your printer and obtain summary statistics. Please double-click on the attached executable file which will allow us to analyze your printer and obtain summary statistics.
Thank you for your cooperation.
Signed. Company X
ATTACHMENT(S)
SUMMARY. EXE

FIG. 20

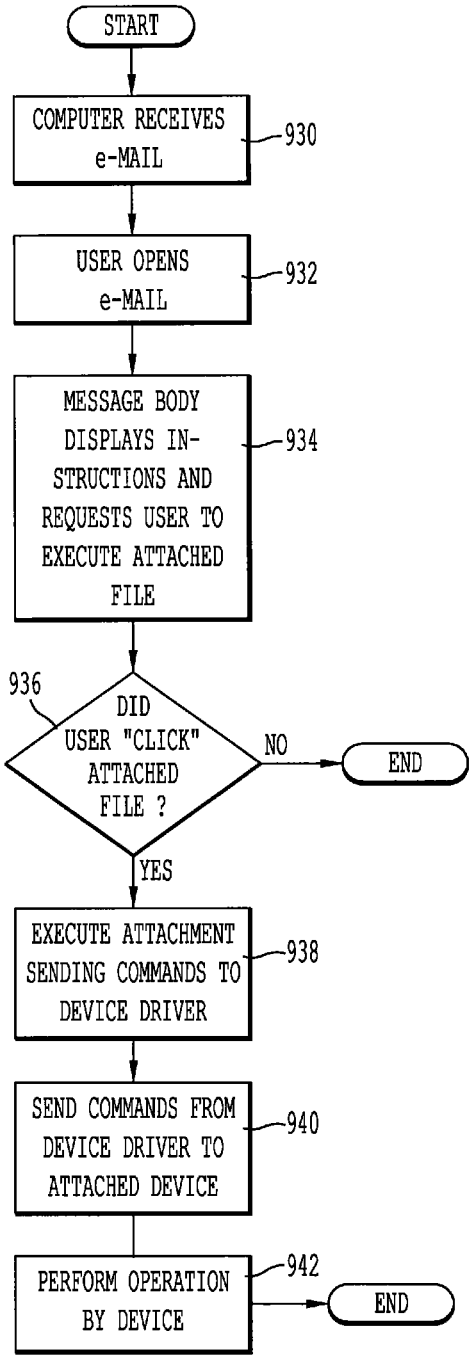
START
COMPUTER RECEIVES e-MAIL
930
USER OPENS e-MAIL
932
MESSAGE BODY DISPLAYS IN-STRUCTIONS AND REQUESTS USER TO EXECUTE ATTACHED FILE
934
936
DID USER "CLICK" ATTACHED FILE ?
NO
END
YES
EXECUTE ATTACHMENT SENDING COMMANDS TO DEVICE DRIVER
938
SEND COMMANDS FROM DEVICE DRIVER TO ATTACHED DEVICE
940
PERFORM OPERATION BY DEVICE
942
END

FIG. 21

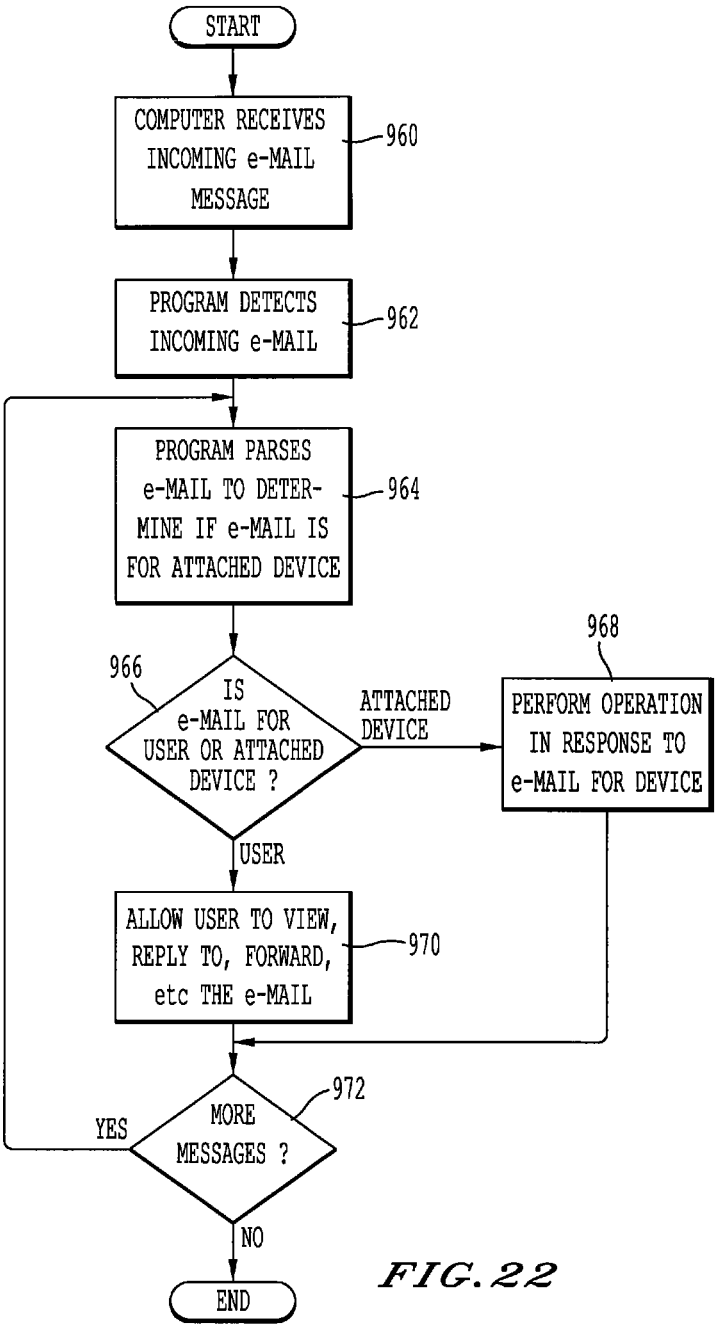
START
COMPUTER RECEIVES INCOMING e-MAIL MESSAGE
960
PROGRAM DETECTS INCOMING e-MAIL
962
PROGRAM PARSES e-MAIL TO DETER-MINE IF e-MAIL IS FOR ATTACHED DEVICE
964
966
IS e-MAIL FOR USER OR ATTACHED DEVICE ?
ATTACHED DEVICE
968
PERFORM OPERATION IN RESPONSE TO e-MAIL FOR DEVICE
USER
ALLOW USER TO VIEW, REPLY TO, FORWARD, etc THE e-MAIL
970
MORE MESSAGES ?
972
YES
NO
END

FIG. 22

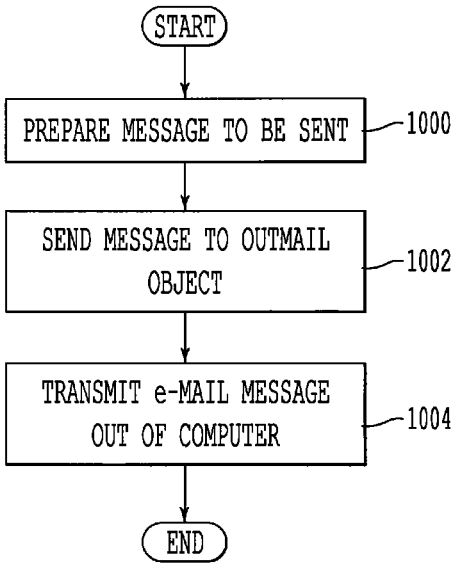
START
PREPARE MESSAGE TO BE SENT
1000
SEND MESSAGE TO OUTMAIL OBJECT
1002
TRANSMIT e-MAIL MESSAGE OUT OF COMPUTER
1004
END

FIG. 23

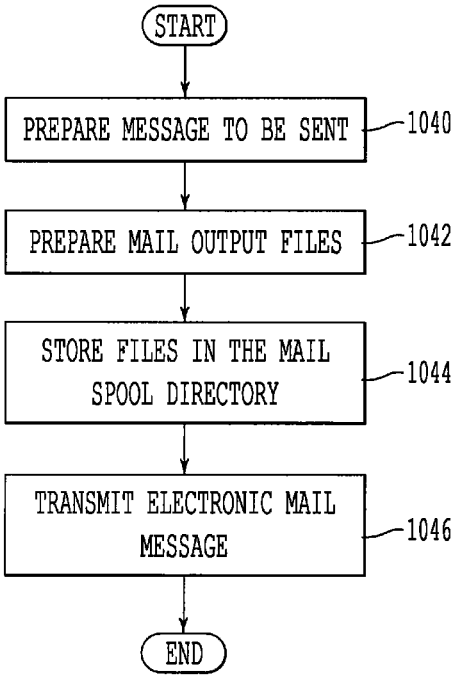
START
PREPARE MESSAGE TO BE SENT
1040
PREPARE MAIL OUTPUT FILES
1042
STORE FILES IN THE MAIL SPOOL DIRECTORY
1044
TRANSMIT ELECTRONIC MAIL MESSAGE
1046
END

FIG. 24

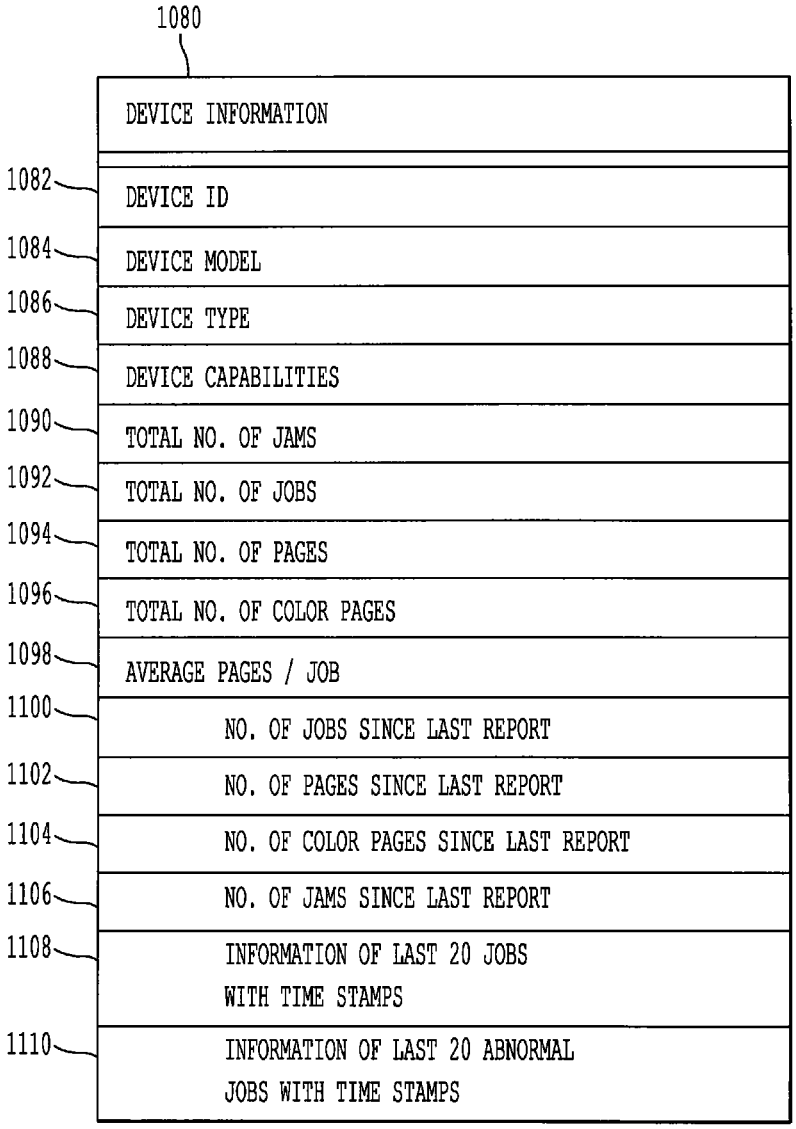
1080
DEVICE INFORMATION
1082
DEVICE ID
1084
DEVICE MODEL
1086
DEVICE TYPE
1088
DEVICE CAPABILITIES
1090
TOTAL NO. OF JAMS
1092
TOTAL NO. OF JOBS
1094
TOTAL NO. OF PAGES
1096
TOTAL NO. OF COLOR PAGES
1098
AVERAGE PAGES / JOB
1100
NO. OF JOBS SINCE LAST REPORT
1102
NO. OF PAGES SINCE LAST REPORT
1104
NO. OF COLOR PAGES SINCE LAST REPORT
1106
NO. OF JAMS SINCE LAST REPORT
1108
INFORMATION OF LAST 20 JOBS WITH TIME STAMPS
1110
INFORMATION OF LAST 20 ABNORMAL JOBS WITH TIME STAMPS

FIG. 25

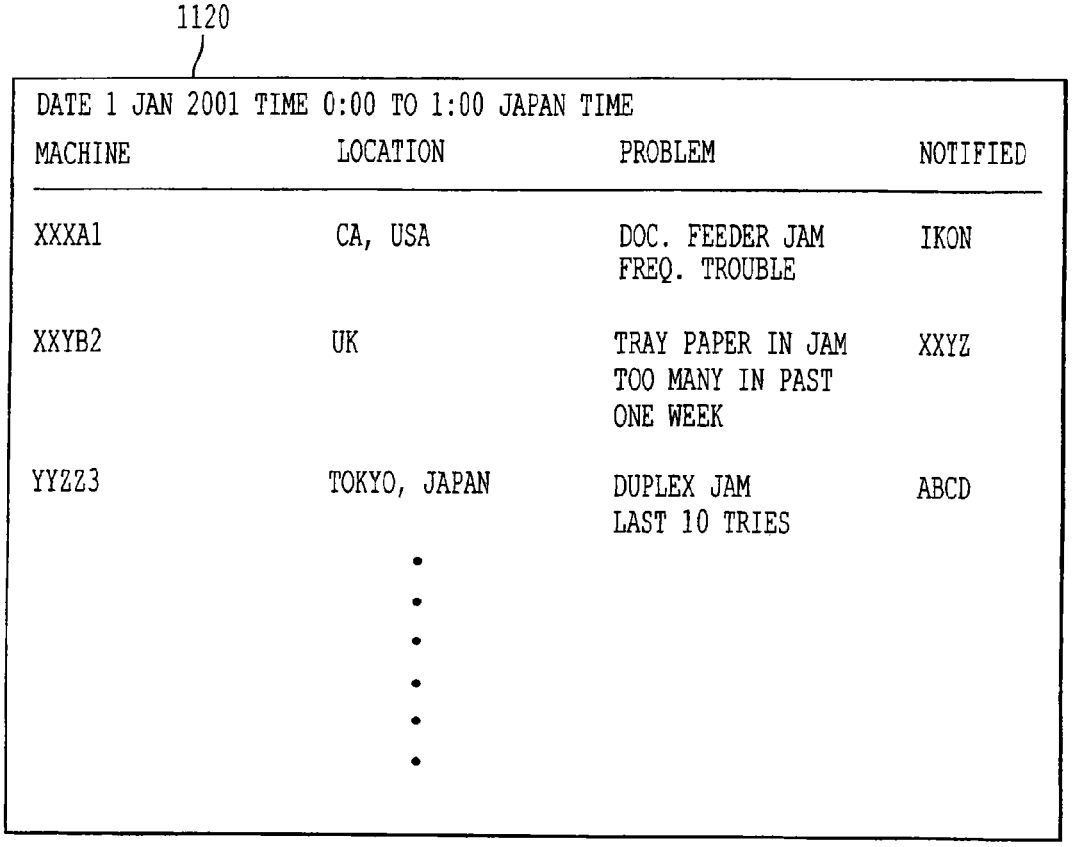
1120
DATE 1 JAN 2001 TIME 0:00 TO 1:00 JAPAN TIME
MACHINE
LOCATION
PROBLEM
NOTIFIED
XXXA1
CA, USA
DOC. FEEDER JAM FREQ. TROUBLE
IKON
XXYB2
UK
TRAY PAPER IN JAM TOO MANY IN PAST ONE WEEK
XXYZ
YYZZ3
TOKYO, JAPAN
DUPLEX JAM LAST 10 TRIES
ABCD

FIG. 26

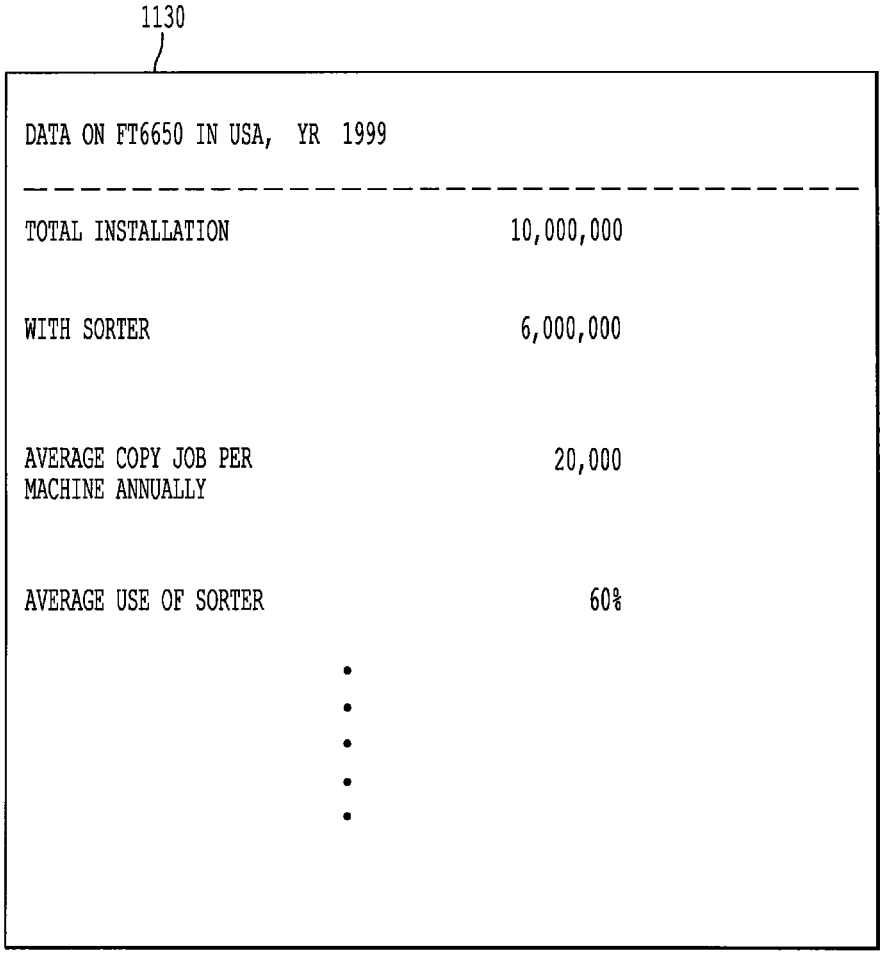
1130
DATA ON FT6650 IN USA, YR 1999
TOTAL INSTALLATION 10,000,000
WITH SORTER 6,000,000
AVERAGE COPY JOB PER MACHINE ANNUALLY 20,000
AVERAGE USE OF SORTER 60%

FIG. 27

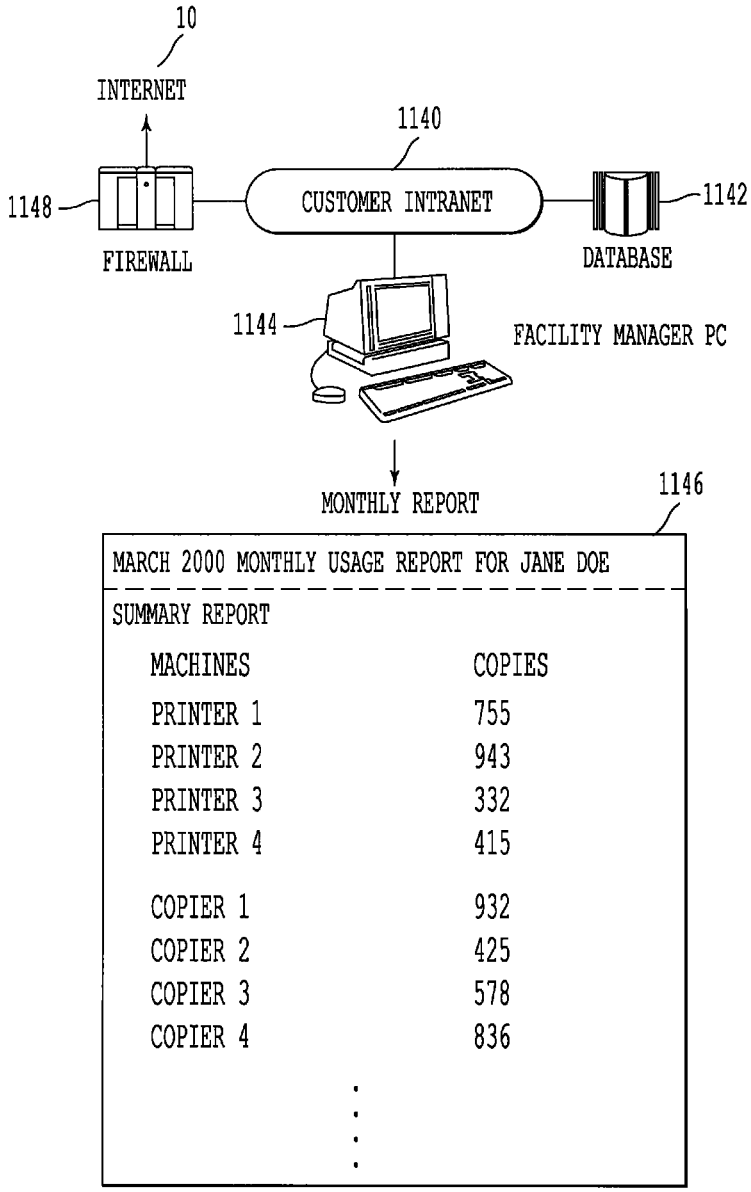
10
INTERNET
1140
1148
CUSTOMER INTRANET
1142
FIREWALL
DATABASE
1144
FACILITY MANAGER PC
MONTHLY REPORT
1146
MARCH 2000 MONTHLY USAGE REPORT FOR JANE DOE
SUMMARY REPORT
MACHINES COPIES
PRINTER 1 755
PRINTER 2 943
PRINTER 3 332
PRINTER 4 415
COPIER 1 932
COPIER 2 425
COPIER 3 578
COPIER 4 836

FIG. 28

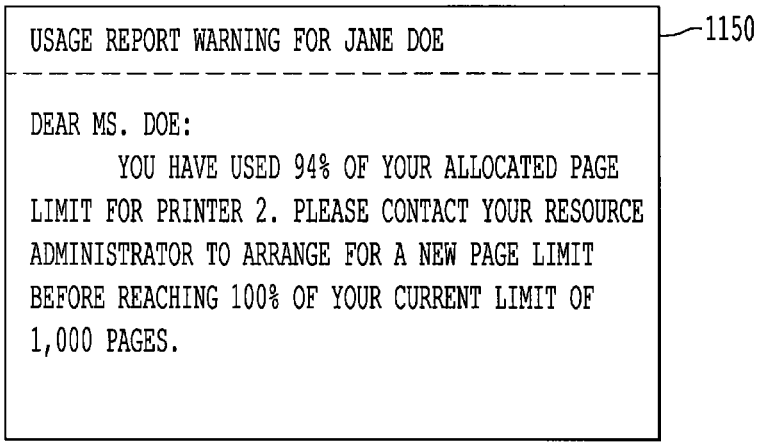
USAGE REPORT WARNING FOR JANE DOE
1150
DEAR MS. DOE:
YOU HAVE USED 94% OF YOUR ALLOCATED PAGE LIMIT FOR PRINTER 2. PLEASE CONTACT YOUR RESOURCE ADMINISTRATOR TO ARRANGE FOR A NEW PAGE LIMIT BEFORE REACHING 100% OF YOUR CURRENT LIMIT OF 1,000 PAGES.

FIG. 29

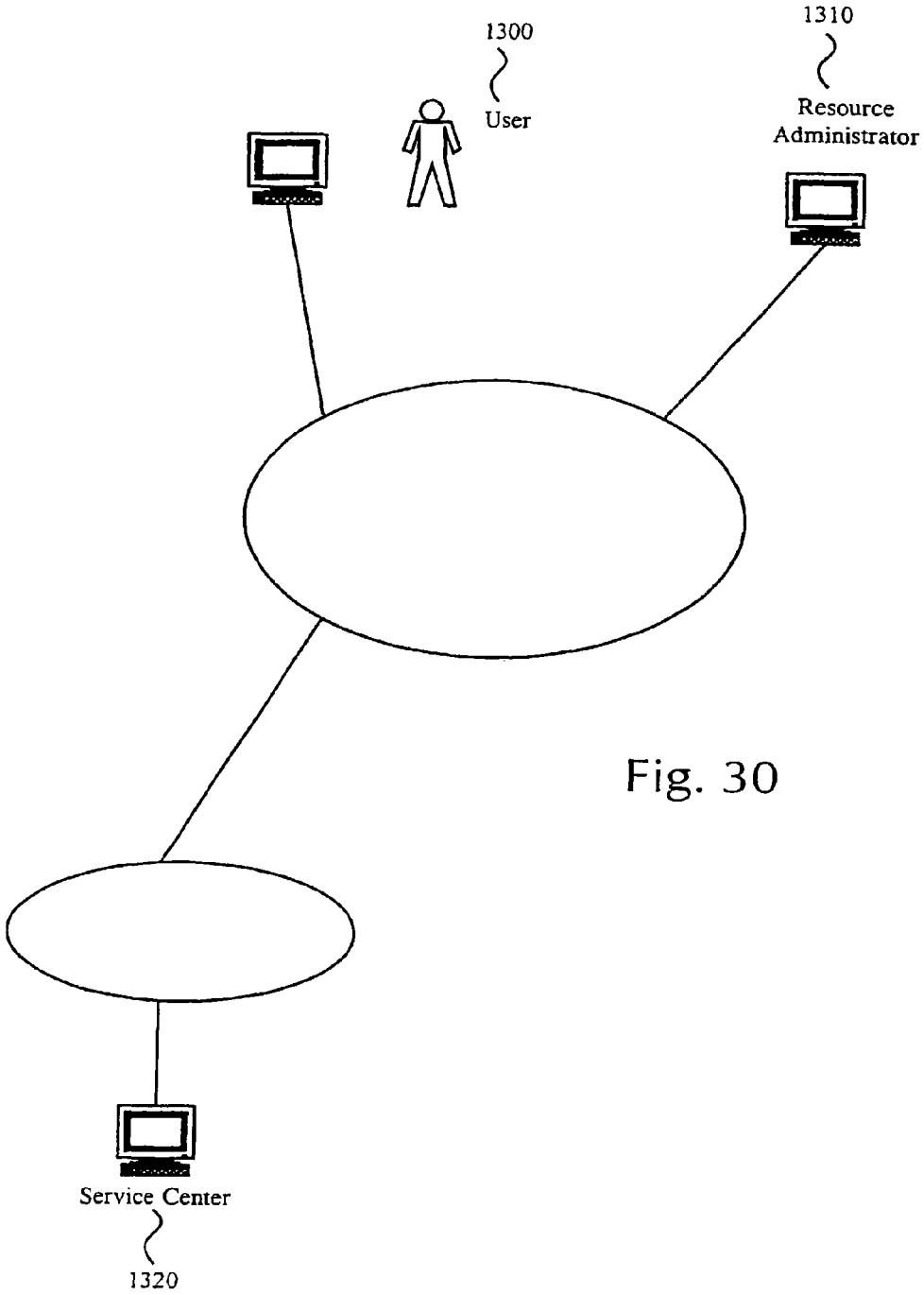
1300
User
1310
Resource Administrator
Service Center
1320

Fig. 30

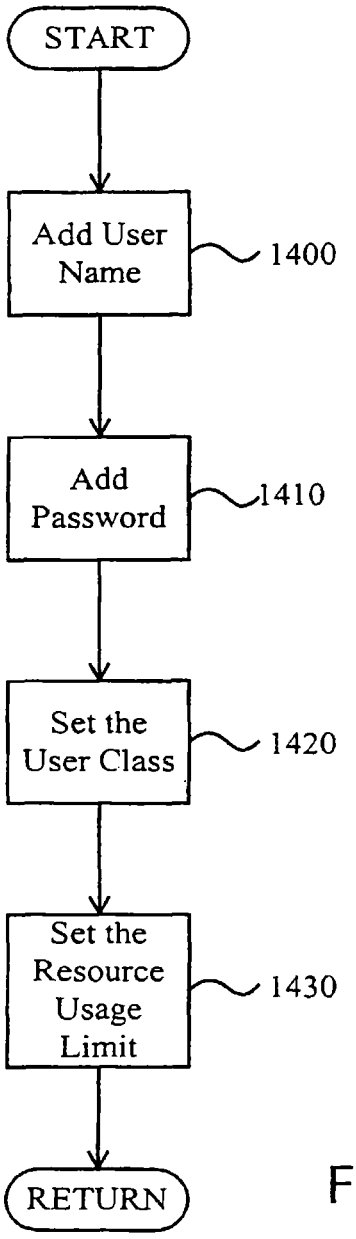
START
Add User Name
1400
Add Password
1410
Set the User Class
1420
Set the Resource Usage Limit
1430
RETURN

Fig. 31

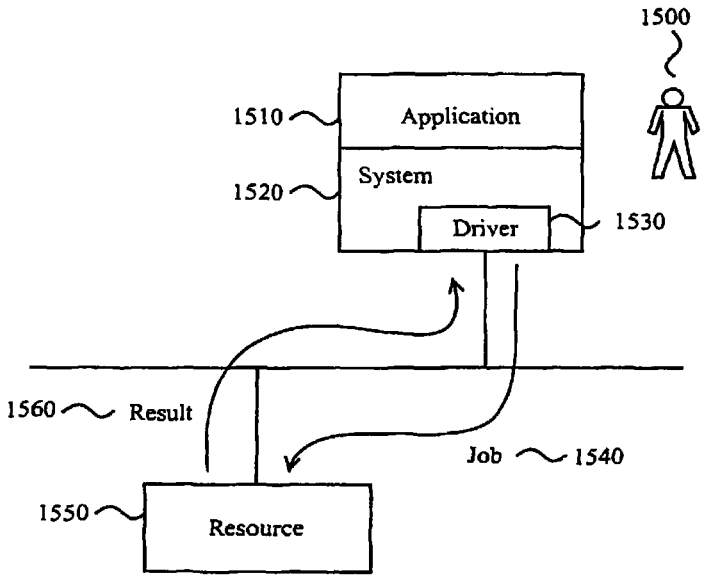
1500
1510
Application
System
1520
Driver
1530
1560
Result
Job
1540
1550
Resource

Fig. 32

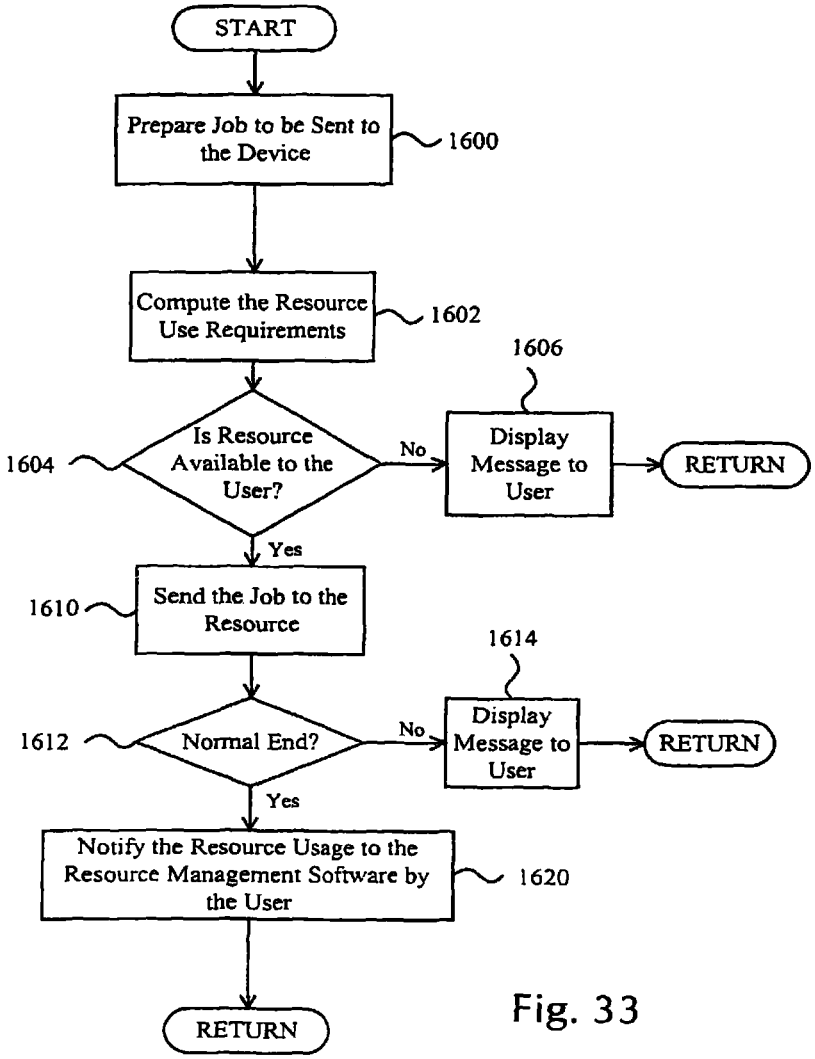
START
Prepare Job to be Sent to the Device
1600
Compute the Resource Use Requirements
1602
1606
Is Resource Available to the User?
1604
No
Display Message to User
RETURN
Yes
Send the Job to the Resource
1610
1614
Normal End?
1612
No
Display Message to User
RETURN
Yes
Notify the Resource Usage to the Resource Management Software by the User
1620
RETURN

Fig. 33

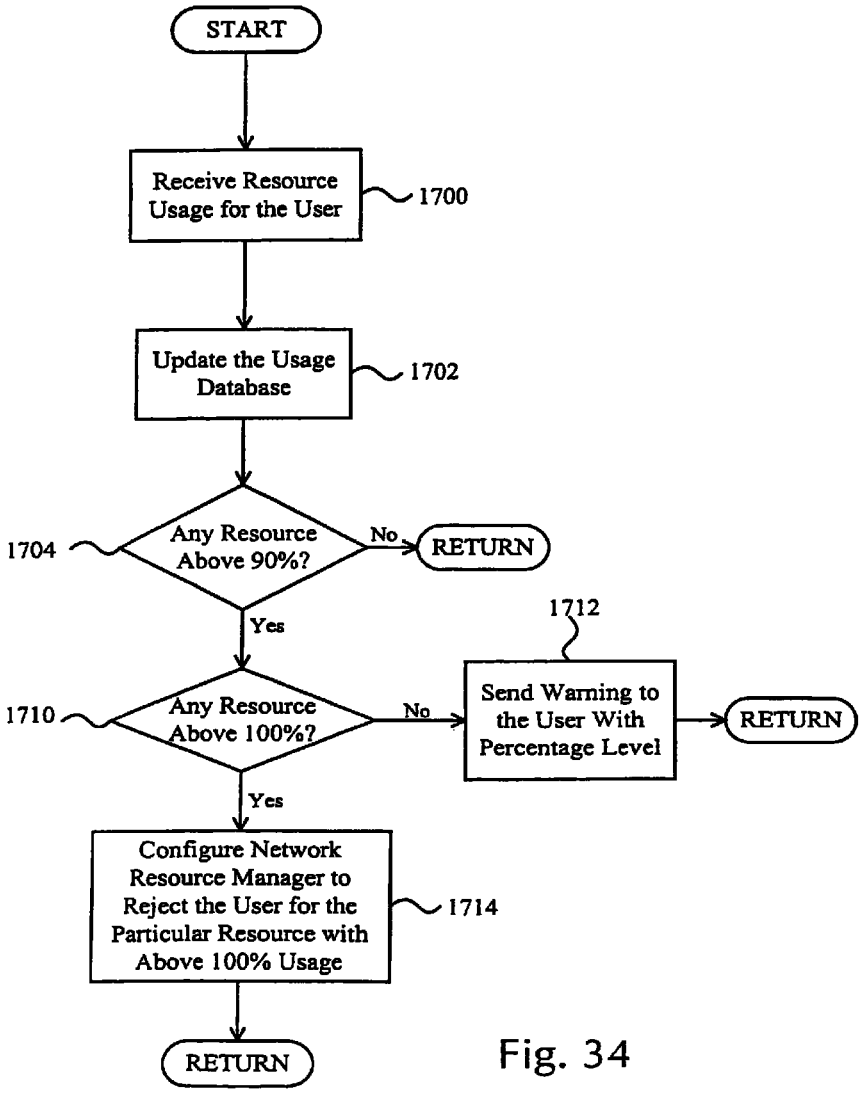
START
Receive Resource Usage for the User
1700
Update the Usage Database
1702
1704
Any Resource Above 90%?
No
RETURN
Yes
1712
1710
Any Resource Above 100%?
No
Send Warning to the User With Percentage Level
RETURN
Yes
Configure Network Resource Manager to Reject the User for the Particular Resource with Above 100% Usage
1714
RETURN

Fig. 34

METHOD AND SYSTEM FOR REMOTE DIAGNOSTIC, CONTROL AND INFORMATION COLLECTION BASED ON VARIOUS COMMUNICATION MODES FOR SENDING MESSAGES TO USERS

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation application of U.S. application Ser. No. 13/846,329, filed Mar. 18, 2013, which is a continuation Ser. No. 13/446,433, filed Apr. 13, 2012, now U.S. Pat. No. 8,429,271, which is a continuation application of U.S. application Ser. No. 13/090,849, filed Apr. 20, 2011, now U.S. Pat. No. 8,161,153, which is a continuation application of U.S. patent application Ser. No. 12/715,116, filed Mar. 1, 2010, now U.S. Pat. No. 7,958,236, which is a continuation application of U.S. patent application Ser. No. 12/028,281, filed Feb. 8, 2008, now U.S. Pat. No. 7,689,691, which is a continuation application of U.S. patent application Ser. No. 11/390,198, filed Mar. 28, 2006, now U.S. Pat. No. 7,353,273, which is a continuation application of U.S. patent application Ser. No. 10/784,831, filed Feb. 24, 2004, now U.S. Pat. No. 7,043,551, which is a continuation application of U.S. patent application Ser. No. 10/423,983, filed Apr. 28, 2003, now U.S. Pat. No. 6,714,971, which is a continuation application of U.S. patent application Ser. No. 09/407,769, filed Sep. 29, 1999, now U.S. Pat. No. 6,581,092. The entire contents of the above-identified applications are incorporated herein by reference.

The present application is related to U.S. patent application Ser. No. 09/311,148 filed May 13, 1999, (now U.S. Pat. No. 7,131,070) entitled "Application Unit Monitoring and Reporting System and Method," U.S. patent application Ser. No. 09/192,583 filed Nov. 17, 1998 entitled "Method and System for Communicating with a Device Attached to a Computer Using Electronic Mail Messages," U.S. patent application Ser. No. 08/883,492 filed Jun. 26, 1997 entitled "Method and System for Diagnosis and Control of Machines Using Connectionless Modes Having Delivery Monitoring and an Alternate Communication Mode," U.S. patent application Ser. No. 08/820,633 filed Mar. 19, 1997 entitled "Method and System to Diagnose a Business Office Device Based on Operating Parameters Set by a User," now U.S. Pat. No. 5,887,216, U.S. patent application Ser. No. 08/733,154 filed Oct. 16, 1996 entitled "Method and System for Diagnosis and Control of Machines Using Connectionless Modes of Communication," now U.S. Pat. No. 5,909,493, U.S. patent application Ser. No. 08/880,683, (now U.S. Pat. No. 6,330,628) filed Jun. 23, 1997, U.S. patent application Ser. No. 09/107,989 (now U.S. Pat. No. 6,801,331) and Ser. No. 09/108,705, both of which were filed Jul. 1, 1998, all three of which are entitled "Method and System for Controlling and Communicating with Machines Using Multiple Communication Formats," and all three of which are divisions of U.S. patent application Ser. No. 08/7624,228 filed Mar. 29, 1996, now U.S. Pat. No. 5,818,603, entitled "Method and System for Controlling and Communicating with Machines Using Multiple Communication Formats," U.S. patent application Ser. No. 08/738,659 (now U.S. Pat. No. 6,889,263) and Ser. No. 08/738,461 (now U.S. Pat. No. 6,990,952), both of which are entitled "Method and System for Diagnosis and Control of Machines Using Connection and Connectionless Modes of Communication," filed Oct. 30, 1996, and are divisions of, and U.S. patent application Ser. No. 08/916,009, entitled "Method and System for Diagnosis and Control of Machines Using Connection and Connectionless Modes of Communication," filed Aug. 21, 1997, which is a continuation of, U.S. patent application Ser. No. 08/463,002 filed Jun. 5, 1995, entitled "Method and System for Diagnosis and Control of Machines Using Connection and Connectionless Modes of Communication," now U.S. Pat. No. 5,819,110, and U.S. patent application Ser. No. 08/852,413 filed May 7, 1987, entitled "Method and System for Controlling and Communicating with Business Office Devices," now U.S. Pat. No. 5,774,678, which is a continuation of U.S. patent application Ser. No. 08/698,068 filed Aug. 15, 1996, entitled "Method and Apparatus for Controlling and Communicating With Business Office Devices," now U.S. Pat. No. 5,649,120 which is a continuation of U.S. patent application Ser. No. 08/562,192 filed Nov. 22, 1995, now U.S. Pat. No. 5,568,618, which is a continuation of U.S. patent application Ser. No. 08/473,780 filed Jun. 6, 1995, entitled "Method and Apparatus for Controlling and Communicating With Business Office Devices," now U.S. Pat. No. 5,544,289, which is a continuation of U.S. patent application Ser. No. 08/426,679 filed Apr. 24, 1995, now U.S. Pat. No. 5,537,554, entitled "Method and Apparatus for Controlling and Communicating With Business Office Devices" which is a continuation of U.S. patent application Ser. No. 08/282,168 filed Jul. 28, 1994 and entitled "Method and Apparatus for Controlling and Communicating With Business Office Devices," now U.S. Pat. No. 5,412,779, which is a continuation of U.S. patent application Ser. No. 07/549,278, filed Jul. 6, 1990, now abandoned, the disclosure of each is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to the use of network messages for communicating information to an end user regarding the usage of a network resource. The invention is more particularly related to the processing performed within a computer in order to process and forward the appropriate information from the network resource to the end user. The invention is further related to a method and system for sending an electronic mail message to an end user regarding the end user's usage of the network resource. Still further, the invention is related to the transmission of a warning message to an end user, for example, when a number of pages printed by the end user on a network printer is close to a predetermined limit.

2. Discussion of the Background

Electronic mail ("e-mail") has become very popular for communicating information between people and provides the benefits of being inexpensive and convenient to a user. Extensive information and protocols are available explaining how e-mail including Internet e-mail operates and there are many commercially available programs for implementing e-mail functions.

Internet facsimile is also available. See, for example, Toyoda, K, Ohno, H., Murai, J., Wing, D., "A Simple Mode of Facsimile Using Internet Mail," March, 1998, The Internet Society, Request For Comments ("RFC") 2305, produced by the Internet Engineering Task Force ("IETF") Fax Working Group, the entire contents of which are incorporated by reference herein.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a method, system, and program product for implementing communication using electronic network messages or e-mail.

It is another object of this invention to provide a method, system, and program product in which an electronic network message regarding usage of a network resource is transmitted to an end user.

It is yet another object of the invention to provide a method, system, and program product which transmits information regarding usage of a device originating from the device through a computer.

It is yet another object of the invention to provide a method, system, and program product which transmits summary information regarding usage of a device originating from the device through a service center to a resource manager or resource administrator.

It is a further object of the invention to provide a method, system, and program product which transmits information regarding usage of a device originating from a device to a resource manager or resource administrator or to a service center.

It is yet another object of the invention to provide a method, system, and program product which transmits information regarding usage of a device to an end user.

These and other objects are accomplished by a method, system, and program product in which an electronic network message regarding the usage of a network resource is received by a computer. When it is determined that the electronic network message contains information regarding usage of the network resource by a particular end user, a communication may be transmitted from the computer to the end user. For example, the end user may receive a warning message that a number of printed pages is getting close to a predetermined limit.

In an embodiment of the invention, a message regarding the usage of a device by a particular end user may be sent from the device either to a resource administrator or through a firewall to a service center. Resource usage of network devices by a particular end user may be transmitted from the devices to transmit the appropriate information regarding usage of the devices to either the resource administrator or a service center. For some resources, a device driver may be needed to perform this task. Resource usage, such as, for example, the number of pages printed by an end user, is tracked for an intranet so that an end user's resource usage is still tracked even if the user changes stations on the intranet. When, for example, a user receives a message that his/her usage of a particular network resource is close to a predetermined limit, the user may take an appropriate action such as, for example, requesting an increase of the resource limit. If the user exceeds his/her limit, he/she may be prohibited from using further network resources. A device or network resource may be any type of device including a hard disk space, a business office device such as a printer, a copier, a scanner, or a facsimile machine, a digital camera, or any other electronic device which is desired to be remotely monitored and/or controlled including equipment for remotely monitoring and controlling utility meters and household appliances. In this context, a user, or an end user, may include both human users and electronic users such as, for example, a software agent.

The invention also relates to the transmission of an outgoing e-mail message from a computer containing information from an attached device as one means to transmit the resource usage information to a resource administrator or a service center. Information from the device may be transmitted to a device driver of the computer and subsequently to a Messaging Application Programming Interface ("MAPI") of the computer. If desired, the transmission of the electronic mail message from the device may establish a TCP ("Transmission Control Protocol") connection between the computer and the device which functions as a message transfer agent. As a further alternative, one or more files may be created within the computer and these files may be written to a mail spool directory of the computer. When the computer detects the existence of the file(s) in the mail spool directory, an e-mail message is transmitted from the computer. If it is desired, and if the environment supports it, the information may be sent directly to the resource administrator or the service center without using e-mail transmission.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. **1** illustrates three networked business office machines connected to a network of computers and data bases through the Internet;

FIG. **2** illustrates the components of a digital copier/printer;

FIG. **3** illustrates the electronic components of the digital copier/printer illustrated in FIG. **2**;

FIG. **4** illustrates details of the multi-port communication interface illustrated in FIG. **3**;

FIG. **5** illustrates an alternative system configuration in which business office devices are connected to a computer which is connected to a network, and also devices which are connected directly to the network;

FIG. **6**A illustrates in block diagram format a manner in which information may be communicated to or from a device using electronic mail;

FIG. **6**B illustrates an alternative way of communicating using electronic mail in which the computer which is connected to the device also serves as a message transfer agent;

FIG. **6**C illustrates an alternative way of communicating using electronic mail in which the device includes a message transfer agent;

FIG. **7** illustrates an alternative manner of sending messages across the Internet;

FIGS. **8**A and **8**B illustrate an exemplary computer which may be connected to the device and used to communicate electronic mail messages;

FIG. **9** illustrates in block diagram format modules, objects, and information which are contained within a computer;

FIG. **10** illustrates information of a device driver which may be used with this invention;

FIG. **11** illustrates a network with resource administration stations and a service center,

FIG. **12** illustrates an intranet with a resource administrator, end user stations, and devices connected to the intranet;

FIG. **13** is a data flow diagram of communications to and from the device;

FIG. **14** is a flowchart illustrating the process of the data flow diagram of FIG. **13**;

FIG. **15** is a flowchart illustrating the processing performed when communication is initiated by the device;

FIG. **16** is a flowchart illustrating the processing performed when a non-urgent message is sent from the device;

FIG. **17** is a flowchart illustrating the processing performed when an urgent message is sent from the device;

FIG. **18** is a flowchart illustrating the processing performed when a message is sent from the service center;

FIG. **19**A illustrates an exemplary e-mail message and FIG. **19**B illustrates an executable file which may be attached to the e-mail message of FIG. **19**A;

FIG. **20** illustrates a screen display of an e-mail message;

FIG. **21** illustrates a method of receiving an e-mail message;

FIG. **22** illustrates a second method of receiving an e-mail message;

FIG. **23** illustrates a method of transmitting an e-mail message;

FIG. **24** illustrates another method of transmitting an e-mail message;

FIG. **25** illustrates a data structure containing device information;

FIG. **26** illustrates a log of trouble information which has occurred in various devices;

FIG. **27** illustrates query results of information relating to a specific printer; and

FIG. **28** illustrates an intranet with a resource administrator generating a usage report;

FIG. **29** illustrates a warning message which is generated when a user has reached a certain percentage of resource usage;

FIG. **30** illustrates an exemplary generalized network having a resource administrator, a service center, and a user;

FIG. **31** is a flowchart illustrating the logic for a resource administrator to create a new user account for a network;

FIG. **32** is a block diagram of a user interacting with application software using a driver to access a network resource;

FIG. **33** is a flowchart of exemplary logic to be used by the driver illustrated in FIG. **32**; and

FIG. **34** is a flowchart of exemplary logic to be used by a Service Center when it receives a message of usage information.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like numerals designate identical or corresponding parts throughout the several views, and more particularly to FIG. **1** thereof, there is illustrated a figure showing various machines and computers for monitoring, diagnosing and controlling the operation of the machines. In FIG. **1**, there is a first network **16**, such as a Local Area Network ("LAN") connected to computer workstations **17**, **18**, **20** and **22**. The workstations can be any type of computers including IBM Personal Computer compatible devices, Unix based computers, or Apple Macintoshes. Also connected to the network **16** are a digital copier/printer **24**, a facsimile machine **28**, and a printer **32**. The devices **24**, **28** and **32** are referred to as machines or monitored devices and other types of devices may be used as the machines or monitored devices, including any of the devices discussed below. Also, a facsimile server (not illustrated) may be connected to the network **16** and have a telephone, ISDN (Integrated Services Digital Network), wireless, or cable connection. In addition to the digital copier/printer **24**, facsimile machine **28**, and printer **32** being connected to the network **16**, these devices may also include conventional telephone and/or ISDN and/or cable connections **26**, **30** and **34**, respectively. As is explained below, the business office machines or business devices **24**, **28** and **32** communicate with a remote monitoring, diagnosis and control station, also referred to as a monitoring device, through the Internet via the network **16** or by a direct telephone, ISDN, wireless or cable connection.

In FIG. **1**, the Internet is generally designated by **10**. The Internet **10** includes a plurality of interconnected computers and routers designated by **12**A-**12**I. The manner of communicating over the Internet is known through Request For Comments ("RFC") documents obtained from www.ietf.org. TCP/IP (Transmission Control Protocol/Internet Protocol) related communication is described for example in the book "TCP/IP Illustrated," Vol. 1, The Protocols, by Stevens, from Addison-Wesley Publishing Company, 1994, which is incorporated herein by reference.

In FIG. **1**, a firewall **14** is connected between the Internet **10** and the network **16**. A firewall is a device that allows only authorized computers to access a network or other computer via the Internet. Firewalls are known and commercially available devices and/or software, for example, include SunScreen from Sun Microsystems Inc. Similarly, a firewall **50** is connected between the Internet **10** and a network **52**. Also, a firewall **40** is connected between the Internet **10** and a workstation **42**.

The network **52** is a conventional network and includes a plurality of workstations **56**, **62**, **68** and **74**. These workstations may be different departments within a company such as marketing; manufacturing, design engineering and customer service departments. In addition to the workstations connected via the network **52**, there is a workstation **42** which is not directly connected to the network **52**. Information in a data base stored in a disk **46** may be shared using proper encryption and protocols over the Internet to the workstations connected directly to the network **52**. Also, the workstation **42** includes a direct connection to a telephone line and/or ISDN and/or cable **44** and the data base in disk **46** may be accessed through the telephone line ISDN, or cable. The cable used by this invention may be implemented using a cable which typically is used to carry television programming, cable which provides for high speed communication of digital data typically used with computers or the like, or may be implemented using any desired type of cable.

Information of the business office machines **24**, **28** and **32** may be stored in one or more of the data bases stored in the disks **46**, **54**, **58**, **64**, **70** and **76**. Each of the customer service, marketing, manufacturing, and engineering departments may have their own data base or may share from one or more data bases. Each of the disks used to store data bases is a non-volatile memory such as a hard disk or optical disk. Alternatively, the data bases may be stored in any storage device including solid state and/or semiconductor memory devices. As an example, disk **64** contains the marketing data base, disk **58** contains the manufacturing data base, disk **70** contains the engineering data base and disk **76** contains the customer service data base. Alternatively, the disks **54** and **46** store one or more of the data bases.

In addition to the workstations **56**, **62**, **68**, **74** and **42** being connected to the Internet, these workstations may also include a connection to a telephone line, ISDN, or cable which provides a secure connection to the machine being monitored, diagnosed and/or controlled and is used during a connection-mode of communication. Additionally, if one of the Internet, telephone, ISDN, or cable is not operating properly, one of the others can be automatically used for communication.

A feature of the present invention is the use of a connectionless-mode of communication (e.g., Internet e-mail) or transmission between a machine and a computer for monitoring, diagnosing and controlling the machine, and transmitting information regarding resource usage to an end user.

Alternatively, the e-mail which is transmitted may be implemented using a connection mode of communication. The IBM Dictionary of Computing by George McDaniel, 1994, defines a connectionless-mode transmission to be the transmission of a single unit of data from a source service access point to one or more destination service access points without establishing a connection. The IBM Dictionary also defines a connection-mode transmission to be the transmission of units of data from a source service access point to one or more destination service access points via a connection. The connection is established prior to data transfer and released following data transfer. Additional information about the connection-mode and the connectionless-mode of operation is described in the Handbook of Computer-Communications Standards, Vol. 1, 2nd Edition, by William Stallings, 1990, which is incorporated herein by reference. In order to transfer data from one DTE (Data Terminal Equipment) to another DTE, there is a unique identifier or address for each DTE. This unique identifier or address is usable in both connection-modes and connectionless-modes of communication.

FIG. **2** illustrates the mechanical layout of the digital copier/printer **24** illustrated in FIG. **1**. In FIG. **2**, **101** is a fan for the scanner, **102** is a polygonal mirror used with a laser printer, and **103** designates an Fθ lens used to collimate light from a laser (not illustrated). Reference numeral **104** designates a sensor for detecting light from the scanner, **105** is a lens for focusing light from the scanner onto the sensor **104**, and **106** is a quenching lamp used to erase images on the photoconductive drum **132**. There is a charging corona unit **107** and a developing roller **108**. Reference numeral **109** designates a lamp used to illustrate a document to be scanned and **110**, **111** and **112** designate mirrors used to reflect light onto the sensor **104**. There is a drum mirror **113** used to reflect light to the photoconductive drum **132** originating from the polygon mirror **102**. Reference numeral **114** designates a fan used to cool the charging area of the digital copier/printer, and **115** is a first paper feed roller used for feeding paper from the first paper cassette **117**, and **116** is a manual feed table. Similarly, **118** is a second paper feed roller for the second cassette **119**. Reference numeral **120** designates a relay roller, **121** is a registration roller, **122** is an image density sensor and **123** is a transfer/separation corona unit. Reference numeral **124** is a cleaning unit, **125** is a vacuum fan, **126** illustrates a transport belt, **127** is a pressure roller, and **128** is an exit roller. Reference numeral **129** is a hot roller used to fix toner onto the paper, **130** is an exhaust fan and **131** is the main motor used to drive the digital copier.

FIG. **3** illustrates a block diagram of the electronic components illustrated in FIG. **2**. The CPU **160** is a microprocessor and acts as the system controller. There is a random access memory **162** to store dynamically changing information including operating parameters of the digital copier. A read only memory **164** stores the program code used to run the digital copier and also information describing the copier (static-state data) such as the model number, serial number of the copier, and default parameters.

There is a multi-port communication interface **166** which allows the digital copier to communicate with external devices. Reference numeral **168** represents a telephone, ISDN, or cable line and **170** represents a network. Further information of the multi-port communication interface is described with respect to FIG. **4**. An interface controller **172** is used to connect an operation panel **174** to a system bus **186**. The operation panel **174** includes standard input and output devices found on a digital copier including a copy button, keys to control the operation of the copier such as number of copies, reducement/enlargement, darkness/lightness, etc. Additionally, a liquid crystal display may be included within the operation panel **174** to display parameters and messages of the digital copier to a user.

A storage interface **176** connects storage devices to the system bus **186**. The storage devices include a flash memory **178** which can be substituted by a conventional EEPROM and a disk **182**. The disk **182** includes a hard disk, optical disk, and/or a floppy disk drive. There is a connection **180** connected to the storage interface **176** which allows for additional memory devices to be connected to the digital copier. The flash memory **178** is used to store semi-static state data which describes parameters of the digital copier which infrequently change over the life of the copier. Such parameters include the options and configuration of the digital copier. An option interface **184** allows additional hardware such as an external interface to be connected to the digital copier. A clock/tinier **187** is utilized to keep track of both the time and date and also to measure elapsed time.

On the left side of FIG. **3**, the various sections making up the digital copier are illustrated. Reference numeral **202** designates a sorter and contains sensors and actuators used to sort the output of the digital copier. There is a duplexer **200** which allows a duplex operation to be performed by the digital copier and includes conventional sensors and actuators. The digital copier includes a large capacity tray unit **198** which allows paper trays holding a large number of sheets to be used with the digital copier. The large capacity tray unit **198** includes conventional sensors and actuators.

A paper feed controller **196** is used to control the operation of feeding paper into and through the digital copier. A scanner **194** is used to scan images into the digital copier and includes conventional scanning elements such as a light, mirror, etc. Additionally, scanner sensors are used such as a home position sensor to determine that the scanner is in the home position and a lamp thermistor to ensure proper operation of the scanning lamp. There is a printer/imager **192** which prints the output of the digital copier and includes a conventional laser printing mechanism, a toner sensor, and an image density sensor. A fuser **190** is used to fuse the toner onto the page using a high temperature roller and includes an exit sensor, a thermistor to assure that the fuser **190** is not overheating, and an oil sensor. Additionally, there is an optional unit interface **188** used to connect to optional elements of the digital copier such as an automatic document feeder, a different type of sorter/collator, or other elements which can be added to the digital copier.

FIG. **4** illustrates details of the multi-port communication interface **166**. The digital copier may communicate to external devices through a Centronics interface **220** which receives or transmits information to be printed, a cable modem unit **221** which has a high speed connection over cable, a SCSI interface **222**, a conventional telephone interface **224** which connects to a telephone line **168**A, an ISDN interface **226** which connects to an ISDN line **168**B, an RS-232 interface **228**, and a LAN interface **230** which connects to a LAN **170**. A single device which connects to both a Local Area Network and a telephone line is commercially available from Megahertz and is known as the Ethernet-Modem.

The CPU or other microprocessor or circuitry executes a monitoring process to monitor the state of each of the sensors of the digital copier, and a sequencing process is used to execute the instructions of the code used to control and operate the digital copier. Additionally, there is a central system control process executed to control the overall opera-

tion of the digital copier and a communication process used to assure reliable communication to external devices connected to the digital copier. The system control process monitors and controls data storage in a static state memory such as the ROM **164** of FIG. **3**, a semi-static memory such as the flash memory **178** or disk **182**, or the dynamic state data which is stored in a volatile or non-volatile memory such as the RAM **162** or the flash memory **178** or disk **182**. Additionally, the static state data may be stored in a device other than the ROM **164** such as a non-volatile memory including either of the flash memory **178** or disk **182**.

The above details have been described with respect to a digital copier but the present invention is equally applicable to other business office machines or devices such as an analog copier, a facsimile machine, a scanner, a printer, a facsimile server, or other business office machines, or an appliance with which a user interfaces such as, for example, a microwave oven, VCR, digital camera, cellular phone, palm top computer, etc. Additionally, the present invention includes other types of machines which operate using a connection-mode or connectionless-mode of communication, and also e-mail, such as a metering system including a gas, water, or electricity metering system, household appliances, vending, machines, or any other device which Performs mechanical operations, such as automobiles, and has a need to be monitored, and performs a function. In addition to monitoring special purpose machines, and computers, the invention can be used to monitor, control, and diagnose a general purpose computer which would be the monitored and/or controlled device, and information regarding resource usage by an end user may be communicated to a resource manager, a service center and to the end user.

FIG. **5** illustrates an alternative system diagram of the invention in which different devices and sub-systems are connected to the Internet **10**. However, there is no requirement to have each of these devices or sub-systems as part of the invention but any individual component or subsystem illustrated in FIG. **5** is also part of the invention. Further, the elements illustrated in FIG. **1** may be connected to the Internet **10** which is illustrated in FIG. **5**. In FIG. **5**, there is illustrated a fire wall **250** connected to an intranet **252**. One of the computers or devices connected to the intranet **252** is a service machine **254** which includes therein or has connected thereto data **256** which may be stored in a data base format. The data **256** includes history, performance, malfunction, resource usage information for particular end users and particular devices, and any other information including statistical information of the operation or failure or set-up and components or optional equipment of devices which are being monitored. The service machine **254** may be implemented as the device or computer which requests the monitored devices to transmit data or which requests that remote control and/or diagnosis tests be performed on the monitored devices, and which transmits information to the end user regarding the end user's resource usage. The service machine **254** may be implemented as any type of device and is preferably implemented using a computerized device such as a general purpose computer.

Another sub-system of FIG. **5** includes a fire wall **258**, an intranet **260**, and a printer **262** connected thereto. In this sub-system, there is not a separate general purpose computer connected between the intranet **260** (or a different type of computer network) but the functions of sending and receiving electronic mail messages by the printer **262** (and similarly by a copier **286**) are performed by circuitry, a microprocessor, or any other type of hardware contained within or mounted to the printer **262**.

An alternate type of sub-system includes the use of an Internet service provider **264** which may be any type Of Internet service provider including known commercial companies such as America Online, Netcom, CompuServe, Niftyserve, the Internet service provider Erols, or any other Internet service provider. In this sub-system, a computer **266** is connected to the Internet service provider **264**, through a modem, for example, such as a telephone line modem, a cable modem, modems which use any type of wires such as modems used over an ISDN (Integrated Services Digital Network) line, ASDL (Asymmetric Digital Subscriber Line), modems which use frame relay communication, any digital or analog modem, wireless modems such as a radio frequency modem, a fiber optic modem, or a device which uses infrared light waves. Further, a business office device **268** is connected to the computer **266**. As an alternative to the business office device **268** (and any other device illustrated in FIG. **5**), a different type of machine may be monitored or controlled such as a digital copier, any type of appliance, security system, or utility meter such as an electrical, water, or gas utility meter, or any other device discussed herein.

Also illustrated in FIG. **5** is a fire wall **270** connected to a network **274**. The network **274** may be implemented as any type of computer network, such an Ethernet network, for example. Networking software which may be used to control the network includes any desired networking software including software commercially available from Novell or Microsoft. The network **274** may be implemented as an Intranet, if desired. A computer **272** connected to the network **274** may be used to obtain information from a business office device **278** and generate reports such as reports showing problems which occurred in various machines connected to the network and usage reports of the devices connected to the network **274**. In this embodiment, a computer **276** is connected between the business office device **278** and the network **274**. This computer receives e-mail communications from the network and forwards the appropriate commands or data, or any other information, to the business office device **278**. While it has been stated that the business office device **278** is connected to the computer **276**, there is no requirement for a wired connection between the business office device and the computer and communication between the business office device **278** and the computer **276** may be accomplished using wires or wireless methods including through the use of radio frequency connections and light connections which may be through an infrared connection, or through fiber optics. Similarly, each of the various networks and intranets illustrated in FIG. **5** may be established using any desired manner including through the establishment of wireless networks such as radio frequency networks. The wireless communication described herein may be established using spread spectrum techniques including techniques which use a spreading code and frequency hopping techniques such as the frequency hopping wireless network which is disclosed in the Bluetooth Specification which is described at the world wide web site www.bluetooth.com, which is incorporated herein by reference.

Another sub-system illustrated in FIG. **5** includes a fire wall **280**, an intranet **284**, a computer **282** connected thereto, and a copier **286**. The computer **282** may be used to generate reports and request diagnostic or control procedures. These diagnostic and control procedures may be performed with respect to the copier **286** or any of the other devices illustrated in or used with FIG. **5**. While FIG. **5** illustrates a plurality of fire walls, the fire walls are preferable but

optional equipment and therefore the invention may be operated without the use of fire walls, if desired.

FIG. **6**A illustrates a device **300** connected to a typical e-mail exchange system which includes components **302**, **304**, **306**, **308**, **310**, **312**, **314**, **316**, and **318** which may be implemented in a conventional manner and are taken from FIG. 28.1 of Stevens, above. The device **300** may be any of the devices described herein and the user at a terminal **302** may correspond to any of the illustrated computers, such as the computer **276** illustrated in FIG. **5**. While FIG. **6**A illustrates the user at a terminal **302** as being a sender, the sending and receiving functions may be reversed in FIG. **6**A. Further, if desired, there may not be a need for having a user at the terminal. Connected to the user at a terminal **302** is the user agent **304**. Popular user agents for Unix include MB, Berkeley Mail, Elm, and Mush. The user agent creates e-mail messages to be sent and if desired, places these messages to be sent in a queue **306**. The mail to be sent is forwarded to a Message Transfer Agent (MTA) **308**. A common MTA for Unix systems is Sendmail. Typically, the message transfer agents **308** and **312** exchange communications using a TCP (Transfer Communication Protocol) connection or a TCP/IP (Internet Protocol) connection or protocol. It is to be noted that the communication between the message transfer agents **308** and **312** may occur over the Internet, but alternatively may occur over any type of connection including any network connection such as a local area network, wide area network and/or an intranet. Further, any desired connection between the message transfer agents **308** and **312** may be utilized.

From the message transfer agents **312**, e-mail messages are stored in user mailboxes **314** which are transferred to the user agent **316** and ultimately transmitted to the user at a terminal **318** which functions as a receiving terminal.

The TCP provides a connection-mode of transmission. However, a direct connection is usually not established between the sending terminal **302** and receiving terminal **318**. Thus, the transmission of an electronic mail message may be considered a connectionless-mode of communication when it is being referred to as between two users or terminals, but when considering the transfer between MTAs, the communication is usually a connection-mode of communication.

As the Internet is a network accessible by many people and organizations, it is not considered to be secure. Therefore, messages transmitted over the Internet should be encrypted to keep the messages confidential. Encryption mechanisms are known and commercially available which may be used with the present invention. For example, a C library function, crypt( ), is available from Sun Microcomputers for use with the Unix operating system, and other encryption and decryption routines are known and commercially available and may also be used with this invention.

As an alternative to the general structure of FIG. **6**A, a single computer may be used which functions as the user terminal, and also the message transfer agent. As illustrated in FIG. **6**B, the device **300** is connected to a computer **301** which includes the message transfer agent **308**. If desired, the other components on the sending side of FIG. **6**A may be included in the computer **301** of FIG. **6**B including the user agent **304** and the queue of mail to be sent **306**.

A further alternative structure is shown in FIG. **6**C in which the message transfer agent **308** is formed as part of the device **300**. Further, the message transfer agent **308** is connected to the message transfer agent **312** by the TCP connection **310**. This embodiment of FIG. **6**C illustrates a case in which the device **300** is directly connected to the TCP connection **310** and has an e-mail capability. A common instance of this embodiment of FIG. **6**C may be the device **300** is a facsimile machine with an e-mail capability of RFC 2305 (a simple mode of facsimile using Internet mail).

FIG. **7** illustrates an alternative implementation of transferring mail and is based on FIG. 28.3 of Stevens. FIG. **7** illustrates an electronic mail system having a relay system at each end. The arrangement of FIG. **7** allows one system at an organization to act as a mail hub. In FIG. **7**, there are four MTAs connected between the two user agents **304** and **318**. These MTAs include local MTA **322**, relay MTA **328**, relay MTA **332**, and local MTA **340**. The most common protocol used for mail messages is SMTP (Simple Mail Transfer Protocol) which may be used with this invention, although any desired mail protocol may be utilized. In FIG. **7**, **320** designates a sending host which includes the user at a terminal **302**, the user agent **304**, and the local MTA **322**. The device **300** is connected to, or alternatively included within, the sending host **320**. As another case, the device **300** and host **320** can be in one machine where the host capability is built into the device **300**. Other local MTAs include local MTA **324** and **326**. Mail to be transmitted and received may be queued in a queue of mail **330** of the relay MTA **328**. The messages are transferred across the TCP connection **310**, which may be, for example, the Internet, or may be any other type of network or connection.

The transmitted messages are received by the relay MTA **332** and if desired, stored in a queue of mail **334**. The mail is then forwarded to the local MTA **340** of a receiving host **342**. The mail may be placed in one or more of the user mailboxes **314** and subsequently forwarded to the user agent **316** and finally forwarded to the user at a terminal **318**. If desired, the user may not be required to be at the terminal and the mail may be directly forwarded to the terminal without user interaction. Other local MTAs at the receiving side include MTA **338** and local MTA **336** which may have their own mailboxes, user agents, and terminals.

The various computers utilized by the present invention including the computers **266** and **276** of FIG. **5** may be implemented as illustrated in FIGS. **8**A and **8**B. Further, any other computer utilized by this invention may be implemented in a similar manner to the computer illustrated in FIGS. **8**A and **8**B, if desired, including the service machine **254**, computer **272**, and computer **282** of FIG. **5**. However, not every element illustrated in FIGS. **8**A and **8**B is required in each of these computers. In FIGS. **8**A and **8**B, the computer **360** includes a CPU **362** which may be implemented as any type of processor including commercially available microprocessors from companies such as Intel, Motorola, Hitachi and NEC, for example. There is a working memory such as a RAM **364**, and a wireless interface **366** which communicates with a wireless device **368**. The communication between the interface **366** and device **368** may use any wireless medium such as radio waves, or light waves, for example. The radio waves may be implemented using a spread spectrum technique such as Code Division Multiple Access (CDMA) communication or using a frequency hopping technique such as that disclosed in the Bluetooth specification.

There is a ROM **370**, and a flash memory **371**, although any other type of nonvolatile memory may be utilized in addition to or in place of the flash memory **371** such as an EPROM, or an EEPROM, for example. An input controller **372** has connected thereto a keyboard **374** and a mouse **376**. There is a serial interface **378** connected to a serial device, **380**. Additionally, a parallel interface **382** is connected to a parallel device **384**, a universal serial bus interface **386** is

connected to a universal serial bus device **388**, and also there is an IEEE 1394 device, commonly referred to as a fire wire device, connected to an IEEE 1394 interface **398**. The various elements of the computer **360** are connected by a system bus **390**. A disk controller **396** is connected to a floppy disk drive **394** and a hard disk drive **392**. A communication controller **406** allows the computer **360** to communicate with other computers, or send e-mail messages, for example over a telephone line **402**, or a network **404**. An I/O (Input/Output) controller **408** is connected to a printer **410** and a hard disk **412**, for example using a SCSI (Small Computer System Interface) bus. There is also a display controller **416** connected to a CRT (Cathode Ray Tube) **414**, although any other type of display may be used including a liquid crystal display, a light emitting diode display, a Plasma display, etc.

FIG. **9** illustrates various objects such as software objects and modules contained within the computer **360**. The computer **360** is connected to a mail server **430** through which mail is sent and received. The mail server **430** may be located at the Internet service provider **264** of FIG. **5**, may be located on a network, may be owned by the company owning the computer **360**, or may even be located inside of the computer **360**, for example. An e-mail processor **432** is utilized to control the transmitting and receiving of electronic mail messages. The e-mail processor may be implemented in any desired or known manner and may be based on commercially available electronic mail programs such as Microsoft's Outlook Express, or GroupWise by Novell, although any other e-mail program may be used, if desired. As a specific implementation, the e-mail system may retrieve e-mail from the server using POP3 (Post Office Protocol) and to access the e-mail server in order to send e-mails using SMTP (Simple Mail Transfer Protocol), although any other protocol may be used, if desired. If the computer **360** utilizes an operating system such as an operating system from Unix, then the computer will usually have an IP address and a mail system built-in. Therefore, there may be no need to utilize the mail server **430** with such a system. A registry **434** contains various information of the system and may be implemented in the same or similar manner as the registry of Windows 95, Windows 98, and/or Windows NT, for example. Incoming mail information **436** may be utilized to store incoming mail. Additionally, if desired the incoming mail information **436** may be implemented to store the POP3 location, and store file information about the incoming e-mails. Outgoing mail information **438** contains information regarding SMTP and file information for outgoing mail. A device driver **440**, such as a printer driver, scanner driver, or other driver, for example may be used to communicate with the device **442** which may be any type of device from which information is desired or to which information or control signals are to be sent. The device driver **440** is implemented to translate commands or signals from the e-mail processor **432** to signals which are transmitted to the device **442** and vice versa. Alternatively, the e-mail processor **432** may perform more of the processing functions and the device driver **440** may have more simple programming and few responsibilities. Further, any other implementation of the software may be utilized as long as the function of proper communication and control of the device **442** using e-mail messages is performed.

A more detailed exemplary implementation of the device driver **440** of FIG. **9** is illustrated in FIG. **10**. The device driver **440** includes a device function support module **454** which may be implemented to perform the conventional and/or desired functions of a device driver. The device driver **440** also includes a remote control and diagnostic module **452**. If desired, the remote control and diagnostic module **452** may be implemented to perform some or all of the control and/or diagnostic functions which are described in the related patent and patent applications and are incorporated by reference above. By implementing the control and diagnostic module **452** in the device driver **440**, the cost of the device **442** may be reduced and the resources and capabilities of the device **442** may be eliminated or reduced such as by reducing the amount of memory in the device **442** such as DRAM (Dynamic Random Access Memory) or flash memory, for example. This reduced cost is possible as the hardware resources of the computer **360** may be utilized in place of constructing additional hardware to go into the device **442**, if desired. Various information including log information and error information may be stored in a data base which includes device data **456** using any desired hardware and data or data base management software. Further, software within the device **442** may be reduced by increasing the functions performed by the device driver **440** including functions performed by the remote control and diagnostic module **452** and the device function support module **454**. These two software modules may be implemented in one software module, if desired. Additionally, the software which keeps track of the usage of the device may be removed from the device itself and included in the device driver **440**.

FIG. **11** illustrates an exemplary network with resource administration stations and a service center. The Internet **10** provides connectivity to a plurality of Intranets **504**, **522**, **532**, each having firewalls **506**, **526**, and **536**, respectively, for a System **500**. As illustrated, the Intranet **504** is an exemplary Ricoh Intranet including the Ricoh Firewall **506**, a Service Center **502** having access to data **501** in a database connected to a Service Machine at the Service Center **502**. As illustrated, the exemplary Intranet **522** is resident in Europe **528**. The Intranet **522** includes a Resource Administrator **520** and Copier A **524**. The exemplary Intranet **532** resides in the USA **538** and includes a Resource Administrator **530** and a Printer B **534**. Also, as illustrated in FIG. **11**, an Internet Service Provider ("ISP") **540** is connected to a computer **542** which is connected to a Printer C **544**. The data **501** includes information regarding usage by an end user of network resources such as, for example, a number of pages printed by an end user on Printer B **534**, and, for example, a predetermined limit on the end user's allowed number of pages to be printed.

FIG. **12** illustrates an exemplary Intranet **600**, having a Firewall **606**, three end users **620**, **622**, and **624**, a Resource Administrator **610**, and two devices, Printer A **602** and Printer B **604**. The Resource Administration station of the Resource Administrator **610** may be the station of system administration. The Resource Administration station monitors network resource usage such as use of the network printers Printer A **602** and Printer B **604** of FIG. **12**. The resource usage within the Intranet **600**, such as, for example, use of Printer A **602** and Printer B **604** in FIG. **12** is monitored by the Service Center **502** of FIG. **11** and the resource usage information is transferred to the Resource Administration station at predetermined times, or upon the occurrence of predetermined events, for example, when a particular end user is approaching a predetermined limit on a number of pages allowed to be printed by that user. For example, warning messages may be sent when the user reaches 90% of a predetermined limit amount of usage, when the user reaches 95%, 99%, and when the user reaches his/her predetermined limit amount. If a user exceeds pre-

determined limits, the user may, for example, be permitted to complete the current job and then be prohibited from any further resource usage, or the user may be allowed to request a new, higher limit.

Since Printer A **602** and Printer B **604** are connected to a network, they have Internet Protocol ("IP") addresses. The printers **602** and **604** can send status messages to either the Resource Administration station **610** or to the Service Center **502** of FIG. **11** through the Firewall **606** of FIG. **12**. As previously shown, a message can be sent directly to the Resource Administration station **610** if urgent service is needed. Urgent service may include, for example, a copy machine needing toner, a printer running out of paper, a paper jam, a lack of electrical power, or any other device problem which requires immediate attention, either manually or electronically. Also, if a particular end user is approaching a predetermined limit on a number of pages allowed to be printed by that user, a message may be transmitted quickly to the user. Non-urgent messages may include, for example, usage reports such as the number of pages or jobs printed by a printer, the number of calls received by a facsimile machine, data concerning facsimile transmissions made by a particular end user or users of an intranet, the number of copies made by a particular end user, the amount of time an end user has spent utilizing a particular network device, and facsimile information for facsimile transmissions made by a particular end user or an office.

Exemplary details of transmission of urgent and non-urgent transmission are disclosed, for example, in U.S. Pat. No. 5,819,110, and as discussed below. Means other than electronic mail may be used for the purpose of calling attention for urgent service. For routine information, however, the Service Center **502** may manage all resources on the Intranet **600** and may send predetermined selected information to the Resource Administration station **610** using electronic mail. Although the information may be available, for example, on the World Wide Web, busy end users tend to forget to check web sites. Thus, electronic mail is well suited for obtaining the attention of a proper recipient of the message.

It is to be noted that messages transmitted to the Service Center **502** are generated by the network devices. The Service Center **502** may be the central servicing center of a large corporation, for example, while a Resource Administrator may be an entity responsible for managing local resources for an intranet for an office site. It is also to be noted that network devices may include household appliances and meters. In such cases, the Resource Administrator may, for example, be a home computer user. In some instances, the Resource Administrator and the Service Center may be the same workstation having software modules necessary to handle both types of management responsibilities.

FIG. **13** illustrates a data flow diagram which processes incoming messages to and outgoing messages from a machine such as the digital copier/printer. A direct connection process **670** is used to process incoming and outgoing communications in a connection-mode of communication such as through a local area network, telephone line, or ISDN line. Incoming messages pass through buffer **674** to a parsing process **692** which performs parsing of incoming information in a known and conventional manner. The incoming information causes various actions such as the actions illustrated in **694**, **696**, **698** to occur. Some actions require that a message be returned and the returned message is illustrated by the arrows leading to buffer **700**. An output message process is performed which prepares an outgoing message to either the direct connection or e-mail process. The direct connection process passes through buffer **672** before passing through the direct connection process **670**.

For an e-mail-mode of communication, there is an e-mail input processor **676** and an e-mail output processor **678**. Incoming e-mail-mode communications pass through buffer **680** and a decryption process is performed in step **684**. The decrypted information is stored in buffer **686** and passed to a conventional parsing process **692**. As explained above, one or more of the actions **694**, **696** and **698** are performed and outgoing messages pass through the buffer **700** to the output message process **702**. Then, the e-mail-mode outgoing messages pass through a buffer **690**, after which they are encrypted by the encryption process **688**. The encrypted messages then pass through buffer **682** and are transmitted via the e-mail output process **678** over a network such as the Internet to their final destination.

Any type of e-mail-mode of communication may be used by the present invention. An inexpensive and readily available medium through which e-mail messages may pass is the Internet processing electronic mail messages. The e-mail input and output processes may be according to any known Internet e-mail protocol such as used by the BSD Unix mail system which is incorporated into the SunOS 4.1.X. Also, other information describing Internet e-mail operations are readily available through various sources on the Internet itself. It is well known that Internet e-mail requires an identifier or address of the machine which is to receive the e-mail. Further, Internet e-mail protocols typically construct an electronic mail message to include an envelope, a header and a body. The envelope typically includes the identifier or address of the machine or person which is to receive the e-mail and the identifier or address of the originator of the message or where replies to the message are to be sent. The header typically includes a description of the encoding type or version of the e-mail message. The identifier or address of Internet e-mail addresses typically include a name which identifies the recipient or user of an e-mail server, followed by the "@" symbol, followed by the domain name or host name of the mail server. These various features of e-mail are utilized by the BSD Unix mail system of the SunOS 4.1.X. While the Internet provides an inexpensive manner of an e-mail-mode of communication, the Internet electronic mail system may be slow or unreliable and therefore, in certain circumstances, instead of using an e-mail process, a direct connection process as described above, is performed.

FIG. **14** illustrates a flowchart which may be used to implement the data flow diagram illustrated in FIG. **13**. After starting, step **740** determines if decryption is needed and if it is, a decryption routine is performed in step **742**. Step **744** then calls a parser which parses in a conventional manner and step **746** determines if any action needs to be taken. If it does, for example, when information is to be transmitted back to the remote monitoring, diagnosis, or control device, step **748** calls the required routine. Step **750** determines if more processing is needed and flow returns back to step **740** for further processing. Otherwise, flow returns to the calling process.

FIG. **15** illustrates a process performed within the machine which determines whether a connection-mode or an e-mail-mode of communication is needed. After starting, step **770** determines if an event requires communication and if it does not, flow returns to the calling process. If communication is needed, step **772** determines whether the event requires an e-mail-mode or a connection-mode of transmission. Any type of high priority event for which immediate

attention is needed or which the remote monitoring device would be interested in on an expedited basis is sent in a connection-mode of communication. This may be used when a hazardous connection exists within the machine or when something in the machine needs immediate attention. For example, if a thermistor in the fuser unit senses a high and unsafe temperature, a direct connection mode may be used. However, the transmission of a weekly or monthly report indicating the usage and a normal condition state in the machine can use the slower e-mail-mode of communication. Additionally, when the e-mail-mode of communication is not properly functioning, the connection-mode of communication is used. For example, if an Internet e-mail message is not properly received by the monitoring device, a direct connection-mode of communication is used. The e-mail message may contain a request for acknowledgment of receipt and if an acknowledgment is not received within a predetermined time (e.g. 3-24 hours) then a connection-mode communication is used to re-transmit the message. Also, if a connection-mode of communication is not properly functioning, then the e-mail-mode of communication may be used.

If step **772** determines that an event does not require an e-mail-mode of communication, step **776** determines if the direct communication channel is ready. For example, it determines if network, the telephone or ISDN line is available. If it is, a direct communication process is performed in step **778** to transmit the appropriate information. If the direct channel is not ready, step **780** notifies the user through the operation panel that there is a problem with the device. If step **772** determines that the event requires an e-mail-mode of transmission, step **774** calls an e-mail communication process. The process of FIG. **15** then returns to the calling process.

FIG. **16** is a flowchart illustrating the processing performed when a non-urgent message is sent from a device. After starting, step **800** stores the information which needs to be transmitted in dynamic state storage. Step **802** determines whether it is time to send the data. When step **802** determines that it is not time to send the data, control passes to step **800**, which was discussed previously. When step **802** determines that it is time to send data, step **804** packages the information according to the set format, and step **806** sends out the e-mail with the packaged information to its predetermined destination. The process of FIG. **16** then returns to the calling process.

FIG. **17** is a flowchart illustrating the processing performed when an urgent message is sent from the device. After starting, step **820** issues an emergency event notification **820**. Examples of such emergency events may include, for example, a paper jam, an electrical outage, an overheating mechanism on a device, a lack of paper, or a lack of toner. Step **822** packages the information for transmission. Step **824** then sends the message to the Resource Manager and Service Center, for example, the Resource Administrator **520** or **530** or the Service Center **502** of FIG. **11**. The process of FIG. **17** then returns to the calling process.

FIG. **18** is a flowchart illustrating the processing Performed when a message is sent from the service center, for example, from the Service Center **502** of FIG. **11**. After starting, step **860** determines whether the service center needs to send information. If step **860** determines that the service center does not need to send information, then the process of FIG. **18** returns to the calling process. If step **860** determines that the service center needs to send information, step **862** determines whether the information is to be sent to the Resource Manager, for example one of the resource administrators **520** or **530** of FIG. **11**. When step **862** determines that the information is for the resource manager, step **864** packages the information, step **866** sends the packaged information to the resource manager, and the process of FIG. **18** returns to the calling process.

When step **862** determines that the information is not for the resource manager, step **868** determines whether the information is to be sent to the device. When step **868** determines that the information is for the device, step **870** packages the information for the device, step **872** sends the packaged information to the device, and the process of FIG. **18** returns to the calling process. When step **868** determines that the information is not for the device, step **874** identifies the destination for the information to be sent. Step **876** then packages the information for the destination which is identified. Step **878** sends the information to the destination, and the process of FIG. **18** returns to the calling process.

FIG. **19**A illustrates an exemplary e-mail message utilized by the invention. In FIG. **19**A, lines **1-7** are part of the e-mail header. Each header field contains a name, followed by a colon, followed by the field value. RFC (Request For Comments) **822** specifies the format and interpretation of the header fields, which is incorporated by reference. The fields of the header illustrated in FIG. **19**A are fairly standard and self-explanatory. Line **1** indicates from where the e-mail originated, line **2** indicates the date the e-mail was sent, line **3** indicates a name associated with the e-mail address (Service Center), line **4** indicates to whom the e-mail is addressed and line **5** indicates the subject of the e-mail message. Line **6** indicates the MIME version utilized by attachment encodings. MIME is utilized to send binary files in electronic mail messages which permit only ASCII characters. MIME allows the binary encoding to be converted to these ASCII characters which are subsequently converted back to the original binary files at the appropriate time. Such a use of MIME encoding is well known. Line **7** designates one or more content fields such as the type of text, the length of the message and any other desired information.

Additionally, e-mail messages also contain what is referred to as an envelope which is used by the message transfer agents for delivery. The envelope may be specified by SMTP commands such as "mail from" and "RCPT 2". Further information about the envelope is specified in RFC 821, which is incorporated herein by reference. A third part of an e-mail message is the message body which is the content of the message. RFC 822 specifies the body as lines of ASCII text. In FIG. **19**A, the body is set forth in lines **9-18**.

There may be files attached to electronic mail messages, for example as illustrated in FIG. **19**B. The attached file **900** in FIG. **19**B is an executable file which allows a user to execute the programming code contained within the file. The attachment of files including executable files to electronic mail messages is a known feature of e-mail messages.

FIG. **20** illustrates a typical screen display of a computer executing an electronic mail program and displaying the e-mail message of FIG. **19**A. When the FIG. **19**A is displayed, the various encoding information is not shown to the user but is displayed in an appropriate format. At the bottom of the display **910** is a section relating to attachments. The message displayed in FIG. **20** shows an executable file "SUMMARY.EXE" as an attached file. As explained in the body or message of the e-mail, by executing the attached file; the attached file will cause certain testing, gathering of information, controlling, or logging of information of the attached printer. Typically, the attached file is executed by "clicking" or "double-clicking" on the attachment. Alterna-

tively, the attachment may be saved as a separate file and then executed using the appropriate commands available within the operating system. Further, any other desired method may be used to execute the file.

FIG. **21** illustrates a process of receiving an e-mail message which is ultimately used to transmit information such as data, control commands, or diagnostic commands to an attached device according to an embodiment shown in FIGS. **19**A, **19**B and **20**. This method may be performed with any desired type of computerized or other type of hardware and/or software and may be performed using the hardware and software organization, as described above. In the embodiment of FIG. **21**, the e-mail message is received in any conventional or desired manner and it is a manual action by the user which causes the e-mail message to perform the desired operation. In FIG. **21**, after starting, in step **930**, the computer receives an incoming e-mail message. In step **932**, the user opens the e-mail message in accordance with the requirements of the e-mail program which is executing on the user's computer and in step **934**, the message body of the e-mail messages displays instructions and requests the user to execute the attached file. Step **934** corresponds to the display of FIG. **20**. FIG. **20** shows that the message displays to the user the origin of the e-mail message, the purpose of the e-mail message, and how the user should execute the attached file in order to perform the desired operations. Alternatively, any desired message may be displayed to the user. The operations which are performed are determined by the attached file SUMMARY.EXE.

Step **936** determines if the user "clicked" the attached file which causes the attached file to be executed. Alternative manners of executing the attached file may be performed such as double clicking the attached file, saving the attached file and using a command of the operating system to cause the file to execute, or the attached file may be executed in any other way. After the user causes the execution of the attached file to begin, flow proceeds to step **938** which executes the attached file. In the preferred form of the invention, the attached file causes commands to be transmitted to the device driver. In step **940**, the device driver receives the commands from the executing attachment and sends the appropriate commands and information to the attached device. In step **942**, the operation specified by the attached file is performed by the device. Such an operation may be any type of operation including any of the operation, control functions, or data requests or manipulations described in any of the related patents and patent applications specified above. Exemplary operations performed by the device including remote control and diagnostic operations, the transmitting of information pertaining to the operation or failures which have occurred within the device, and also operating parameters utilized by or stored in the device.

While the process of FIG. **21** has been explained with respect to the use of a device driver, the device driver is a convenient label for the routine which allows control of the attached device, and any other type of software which controls the attached device may be utilized in place of the device driver. For example, the e-mail program itself may be able to send commands and/or data directly to the attached device. The attached device may be any of the devices which have been explained above.

One manner of causing the execution of the program code is to use a graphical pointing device such as a mouse connected to the computer, having the user place a pointer on the object representing the file (e.g., the attached file summary.exe), and subsequently having the user press a button while the user points to the file.

FIG. **22** illustrates an alternative embodiment of receiving e-mail messages in which the computer or program executing therein automatically detects that the incoming e-mail message is used for communication with the attached device. Thus, in this embodiment, there may be no need for the user to execute an attached file. In FIG. **22**, after starting, step **960** receives an incoming e-mail message. In step **962**, a program, such as an electronic mail processing program, detects that there is an incoming e-mail message. The detection of incoming e-mail may be performed in any desired manner. Currently, commercially available e-mail programs have the capability to automatically detect incoming e-mail messages and such conventional automatic detecting capabilities may be utilized. Further, in Unix, a specific directory labeled "/var/mail" which contains a file with a user name receives files corresponding to incoming e-mail messages and when this file changes in size, appears, or more files appear, the system can detect that there is an incoming e-mail message. In step **964**, the executing program parses the e-mail to determine if the e-mail is for the attached device. Such parsing is performed by determining if a predetermined code exists at a predetermined place in the e-mail message. Exemplary positions of such a code may be in the subject line of the e-mail message, may be a special code which appears within the message body, may, be a code which appears in the message header, including a user defined field within the header, or may even be in the message envelope. It may also be possible for the incoming e-mail message to have an address which is routed to the computer which is attached to the device and such messages are not displayed to the user but are directly used for processing. For example, the device may have its own account. In that event, the "var/mail" directory previously discussed includes a file with the account name of the device. Step **966** performs an analysis of the parsed e-mail to determine if the e-mail is for the user or for the attached device. When the e-mail is determined to be for the attached device, flow proceeds to step **968** which performs an operation in response to the e-mail for the device. This performed operation may be any of the previously described operations including operations described in the related patents and patent applications including the performing of a mechanical action, such as movement of a scanning bead or printer head or causing any other type of mechanical actions typically performed by the device in question, and also operations including the transmitting of parameters.

When step **966** determines that the attached e-mail is for a user (e.g., the e-mail is unassociated with the attached device and is not used to control or monitor the attached device), flow proceeds from step **966** to step **970** which allows the user to view, reply to, forward, or perform any other desired function on this e-mail. From steps **970** and **968**, control flows to step **972** which determines if there are additional e-mail messages. If there are more messages, flow proceeds back to step **964**. If there are no more messages, the process of FIG. **22** ends.

Another alternative to using e-mail is to send, to a user of the computer, an e-mail message with a web address where an executable file may be downloaded. Unlike attaching executable code, this method will at least allow the user to verify the web site before downloading and executing code. This method requires more work by the user, but allows the user to check the source of the executable code.

In addition to receiving electronic mail messages which are used, for monitoring and/or controlling an attached

device, the invention also includes the transmission of e-mail messages which contain information of the device attached to the computer. The present invention prepares data for transmission in e-mail messages, such as the information which is illustrated in FIGS. **25-28** which are explained below.

FIG. **23** illustrates a first embodiment of transmitting an e-mail message. After starting, the message is prepared to be transmitted in step **1000**. In order to prepare the message to be sent, data which is part of the message is obtained or generated. This data may be obtained by querying the device attached to the computer, or alternatively, is already stored in the computer. The data may also be obtained as disclosed in the related applications, if desired. The e-mail message is prepared to have a format of conventional e-mail systems including the envelope, header, and body of the e-mail message, as explained above, although any desired format may be used.

Step **1002** then sends the message to an outmail object. An outmail object is preferably a software object or routine executing within the computer which performs the transmission out of the computer. The manner in which the transmission is performed in the Microsoft Windows environment is through the use of the Messaging Application Programming Interface ("MAPI"). The MAPI allows interaction with the messaging system and does not require a programmer to write all code which is utilized to transmit messages. By setting the MAPI in Windows to a specific program, such as the Microsoft Outlook Express e-mail program, when a message is transmitted to the outmail object (the MAPI client), the message transmission may became automated. Details regarding the implementation and use of MAPI are set forth in the book "Inside MAPI" by. Irving De la Cruz and Les Thalaer, published by the Microsoft Press, 1996, which is incorporated herein by reference. Any feature regarding the use of MAPI disclosed in this book may be utilized to implement the present invention using the MAPI client. In step **1004**, the e-mail message is transmitted out of the client, preferably using the outmail object.

The outmail object has been described as being the Windows MAPI. However, any other outmail object may be used to assist in the transmission of e-mail messages. Alternatively, a software object does not have to be used but any desired code which assists in the transmission of the outmail object may be utilized.

An alternative manner of transmitting e-mail messages according to the present invention is illustrated in FIG. **24**. The method of FIG. **24** is preferably performed in a Unix environment, although any other software or operating system environment may be utilized as long as the desired steps are performed. In FIG. **24**, after starting, step **1040** prepares the message to be sent. This step is utilized to obtain the information which is to be transmitted and may be performed in a similar manner as when step **1000** of FIG. **23** is performed, if desired. In step **1042** of FIG. **24**, the mail output files are prepared and include the message which was prepared in step **1040**. In step **1044**, the output files which may be one or more files, the number of files being the number appropriate to the operating system, are stored in an outgoing mail directory which in Unix is referred as the mail spool directory. This directory in Unix may be located at /var/spool/mqueue, although any other appropriate directory may be used. Once the appropriate file(s) is (are) stored in the desired location, step **1046** is performed which transmits an electronic mail message corresponding to the file(s) which has been stored. The process of FIG. **24** then ends.

FIG. **25** illustrates a data structure **1080** containing device information. This is information which is preferably transmitted from the device to the computer and/or from the computer out to a network using an e-mail format. FIG. **25** is an exemplary format and any desired format or information of the attached device which is of interest may be transmitted. The data structure **1080** illustrated in FIG. **25** includes a device identification **1082**, a model of the device **1084**, a device type **1086** which indicates information such as whether the device is a scanner, digital copier, printer, fax machine, multifunction device, or any other information regarding the type of the device. Field **1088** illustrates the capabilities of the device such as the optional equipment and capabilities of the device such as the type of output trays (e.g., a sorter), or whether the device has an automatic document feeder, for example, as explained in the related applications and patents. Further, information relating to the operation of the device may be transmitted. The information illustrated in FIG. **25** relates to a printer, copier, or multifunction device, and different information may be utilized for different types of devices. Exemplary information which may be included in the device information data structure **1080** include a total number of page or paper jams **1090**, a total number of jobs which were performed **1092**, a total number of pages printed **1094**, a total number of color pages printed **1096** which is applicable only to color printers or devices, an average number of pages per job **1098**, a number of jobs since the last report **1100**, a number of pages since the last report **1102**, a number of color pages since the last report **1104**, a field **1108** which stores information of the last **20** jobs including the time stamps related to when these jobs occurred, and a field **1110** which includes information of the last. **20** abnormal jobs (e.g., jobs which did not finish in accordance with normal or standard procedures) including the time stamps of when these jobs or abnormalities occurred, if desired.

The present invention may be utilized to create informational reports regarding status or other information of the device which is being monitored. The information of the devices May be transmitted Over the Internet to another company or to a computer of the same company, or alternatively may be transmitted as an e-mail which remains within the private network such as the local area network or a wide area network of a company. A machine which receives e-mail messages prepared and transmitted in accordance with the teachings of this invention may be transmitted to a device such as the service machine **254** illustrated in FIG. **5** or the Service Machine of the Service Center **502** illustrated in FIG. **11**. The service machine may then notify an appropriate entity such as a third party service center, a service center of the device manufacturer such as the copier or printer manufacturer's service center or other authorized service center, or any other entity and indicate that a specific problem exists. Such notification may be performed through electronic mail, through a direct computer connection, through a telephone call to a person using a facsimile transmission, through the indication of a voice message, or in any other desired manner.

FIG. **26** illustrates a log **1120** of collected data from various machines which indicates a problem with the machine. The log contains the identification of the machine which is having the problem, the location of the machine, the particular problem with the machine, and the entity which has been notified. The information which is received and transmitted in accordance with the log of FIG. **26** may operate in accordance with the teachings of any of the

cross-referenced applications. The log may be generated at and/or stored in any of the computers of FIG. **5**, **10** or **11**, for example.

FIG. **27** illustrates an example of data **1130** which has been collected through an inquiry. The inquiry in the example of FIG. **27** may be utilized to indicate the total number of installed machines of a particular model (e.g., the FT **6650**), the number of these devices having a sorter, the average of number of copies per job per machine, and the average use of the sorter. Any other desired information may also be included in the status report. The status report may be generated at and/or stored in any of the computers of FIG. **5**, for example.

FIG. **28** illustrates a customer intranet **1140** with a Facility Manager PC **1144** generating a monthly report **1146** for a particular user. The customer intranet **1140** is connected, through a firewall **1148**, to the Internet **10**, and to a database **1142**. This report could have been generated for a computer network having four printers and three copiers which are located on the customer intranet **1140**. The report was preferably generated according to the teachings of this invention using e-mail messages, although the report could have been generated using the techniques described in the cross-referenced applications, if desired. This type of report allows in-company monitoring of machines, for individual users, which are connected to a network or intranet and the computer maintaining information and statistics about the machines attached to the network may be part of the network, whether it be a local area network, wide area network, or across the Internet, for example. Alternatively, the report could be generated for devices on a plurality of intranets by the Facility Manager PC **1144** which stores appropriate information in the database **1142**.

FIG. **29** illustrates a warning message **1150** which is generated for a particular user when the user has reached a certain percentage level of resource usage. The message is preferably sent to the end user as an e-mail message, although any type of message transmission may be used, including, for example, the intranet resource manager or a driver connected to the device may send a message to the user which appears on the user's screen as a network warning, or alert message.

FIG. **30** illustrates an exemplary generalized network having a Resource Administrator **1310**, a Service Center **1320**, and a User **1300**, which are three essential components of the present invention. The Resource Administrator **1310** corresponds to the Resource Administrators **520** and **530** of FIG. **11** and the Resource Administrator **610** of FIG. **12**. The Service Center **1320** of FIG. **30** corresponds to the Service Machine **254** of FIG. **5** and the Service Machine at the Service Center **502** of FIG. **11**. The Resource Administrator **1310** and Service Center **1320** of FIG. **30** include various software components as described below. The Service Center **1320** has access to a database, for example, the Data **501** shown in FIG. **11**, to keep track of the resource usage by the user **1300** of FIG. **30**. The Resource Administrator **1310** includes a software module which allows the User **1300** to log into the network as discussed below with regard to FIG. **31**. The Resource Administrator **1310** and Service Center **1320** of FIG. **30** may be the same machine, although they are shown as separate entities in FIG. **30**.

FIG. **31** is a flowchart illustrating exemplary logic for the Resource Administrator **1310** of FIG. **30** to create a new user account for a network. After starting, step **1400** of FIG. **31** adds a new user name. Step **1410** adds a password for the new user. Step **1420** sets up the user's class, step **1430** sets a resource usage limit for the user, and control is then returned to the calling process. It is to be noted that steps **1400**, **1410**, **1420** and **1430** may generally be performed in any order to achieve the desired results, even though the flowchart specifies a particular order.

FIG. **32** is a block diagram of a User **1500** interacting with Application software **1510** that in turn uses a Driver **1530** of the System **1520** to access a Resource **1550** in a network. The Driver **1530** transmits a Job **1540** to be performed over the network to the Resource **1550**. The Resource **1550** performs the Job **1540** and then transmits a Result **1560** back to the Driver **1530**. The Result **1550** may, for example, be a message indicating a normal or abnormal termination of the Job **1540**, or it may include usage information, for example, statistical information such as a number pages printed or a number of bytes occupied on a hard drive.

FIG. **33** is a flowchart of exemplary logic to be used by the Driver **1530** illustrated in FIG. **32**. After starting, step **1600** of FIG. **33** prepares a job to be sent to the device. The Driver **1530** of FIG. **32** receives a specific task to be performed at the Resource **1550** of FIG. **32**, such as, for example, printing a word processor document. The Driver **1530** changes the input format of the task to a format that is used by the Resource **1550**. At the same time, in step **1602**, the Driver **1530** computes the amount of resource usage required to perform the task.

Step **1604** of FIG. **33** determines whether the resource is available to the user. The Driver **1530** of FIG. **32** queries the network resource management software residing in the Resource Administrators station **1310** of FIG. **30** to determine whether the Resource **1550** of FIG. **32** is available to the User **1500**. Alternatively, the software may reside at the Service Center **1320** of FIG. **30**, if it can be accessed synchronously. As a further alternative, the Driver **1530** of FIG. **32** may have access to a small database of user permission information which is regularly updated by the Service Center **1320** or the Resource Administrator **1310** of FIG. **30**. If it is determined in step **1604** of FIG. **33** that the user is not allowed to use the Resource **1550**, step **1606** displays a message to the user, and control is returned to the calling process.

If it is determined in step **1604** that the user can use the Resource **1550**, step **1610** sends the Job **1540** to the Resource **1550** of FIG. **32**. Step **1612** of FIG. **33** determines whether the Job **1540** terminated normally. If step **1612** determines that the Job **1540** did not terminate normally, step **1614** displays a message to the user, and control is returned to the calling process. If step **1612** determines that the Job **1540** terminated normally, in step **1620**, the Driver **1530** sends the user and resource usage information to the Service Center **1320** and control is returned to the calling process.

FIG. **34** is a flowchart of exemplary logic to be used by the Service Center **1320** of FIG. **30** when it receives a message of usage information. After starting, in step **1700**, the Service Center **1320** receives a message of user and resource usage information. Step **1702** updates the usage database. Step **1704** determines whether any resource usage is above 90% of a limit allocated for the resource. If step **1704** does not determine that any resource usage is above 90% of a limit allocated for the resource, control is returned to the calling process. When step **1704** determines that, the resource's usage is above 90% of a limit allocated for the resource, step **1710** determines whether the resource's usage is above 100% of a limit allocated to the resource. If step **1710** does not determine that the resource's usage is above 100% of a limit allocated to the resource, step **1712** sends a warning message to the user showing the percentage level of

usage, which is between 90% and 100%. Control is then returned to the calling process. Alternatively, the warning message could be sent, for example, at 90%, 95% and 99% usage of the limit.

When step **1710** determines the resource's usage is above 100%, step **1714** configures the network resource management software at the Resource Administrator station **1310** to block, or deny access to the particular resource by the user. The Resource Administrator **1310** may, alternatively, change the limit or reset the count, if desired. Control is then returned to the calling process.

The present invention may be utilized to create informational reports regarding status, usage or other information of the device which is being monitored. The information of the devices may be transmitted over the Internet to another company or to a computer of the same company, or alternatively may be transmitted as an e-mail which remains within the private network such as the local area network or a wide area network of a company. A machine which receives e-mail messages prepared and transmitted in accordance with the teachings of this invention may be transmitted to a device such as the service machine **254** illustrated in FIG. **5**. The service machine may then notify an appropriate entity such as an end user, a third party service center, a service center of the device manufacturer such as the copier or printer manufacturer's service center or other authorized service center, or any other entity and indicate that a specific problem exists, or indicate informational summary information. Such notification may be performed through electronic mail, through a direct computer connection, through a telephone call to a person using a facsimile transmission, through the indication of a voice message, or in any other desired manner.

In its preferred implementation, the present invention utilizes computers having separate housings than the device to which they are attached. This would allow the invention to be inexpensively implemented for installations which already have an existing computer for performing the desired processing as the new hardware costs may be reduced. Such an arrangement may also permit implementation of the invention without hardware changes to the device. However, if desired, the present invention may be implemented by including the appropriate processing and data storage capabilities in the device which is being monitored and/or controlled in addition to or as an alternative to a separate computer connected to the device. Further, this invention may be particularly applicable to existing installations such as a print server. A print server is connected to a computer network and receives requests to perform printing operations and distributes these printing operations to appropriate printing devices connected to the print server.

This application relates to and builds on various concepts which have been disclosed in the cross-referenced patents and patent applications which have been incorporated into this application by reference. This patent application is intended to include not only the inventions disclosed in the related applications, but also the combinations of various features and functions of the individual embodiments which have been disclosed in this and each of the related applications. Thus, a feature disclosed in one of the related applications or patents may be readily applied to a concept disclosed in this invention, and also, the concepts disclosed in one or more of the other applications may be applied to concepts or features disclosed in other(s) of the applications. Further, an e-mail message may be used for only one of sending and receiving, with communication in the other direction being performed using a different mode of communication, such as one of the other communication modes disclosed herein, or a communication mode disclosed in the related patents and patent applications.

This invention may be conveniently implemented using a conventional general purpose digital computer or microprocessor programmed according to the teachings of the present specification, as will be apparent to those skilled in the computer art. Appropriate software coding can readily be prepared by skilled programmers based on the teachings of the present disclosure, as will be apparent to those skilled in the software art. The invention may also be implemented by the preparation of application specific integrated circuits or by interconnecting an appropriate network of conventional component circuits, as will be readily apparent to those skilled in the art.

The present invention includes a computer program product which is a storage medium including instructions which can be used to program a computer to perform a process of the invention. The storage medium can include, but is not limited to, any type of disk including floppy disks, optical discs, CD-ROMs, and magneto-optical disks, ROMs, RAMs, EPROMs, EEPROMs, magnetic or optical cards, or any type of media suitable for storing electronic instructions.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise then as specifically described herein.

The invention claimed is:

1. A method of monitoring usage of an image output device, comprising:

receiving, from the image output device, a first message transmitted using an Internet application-layer protocol over a network, the received message including a job identifier identifying a job and resource usage information for the job, wherein the job was processed by the image output device for a registered user of the image output device;

obtaining, based on the resource usage information and usage information of the registered user stored in a memory, a total resource usage of the registered user;

determining whether the obtained total resource usage of the registered user reaches a predetermined threshold; and

transmitting a second message over the network to a predetermined destination, when it is determined in the determining step that the obtained total resource usage of the registered user reaches the predetermined threshold.

2. The method of claim **1**, wherein the image output device is one of a copier and a printer.

3. The method of claim **1**, further comprising:

obtaining a device identifier of the image output device;

obtaining model information of the image output device; and

obtaining device type information of the image output device.

4. An apparatus for monitoring usage of an image output device, comprising:

processing circuitry configured to

receive, from the image output device, a first message transmitted using an Internet application-layer protocol over a network, the received message including a job identifier identifying a job and resource usage information for the job, wherein the job was processed by the image output device for a registered user of the image output device;

obtain, based on the resource usage information and usage information of the registered user stored in a memory, a total resource usage of the registered user;

determine whether the obtained total resource usage of the registered user reaches a predetermined threshold; and

transmit a second message over the network to a predetermined destination, when it is determined that the obtained total resource usage of the registered user reaches the predetermined threshold.

5. The apparatus of claim **4**, wherein the image output device is one of a copier and a printer.

6. The apparatus of claim **4**, wherein the processing circuitry is further configured to:

obtain a device identifier of the image output device;

obtain model information of the image output device; and

obtain device type information of the image output device.

7. A non-transitory computer-readable medium storing program instructions that, when executed by processing circuitry, cause the processing circuitry to perform a method of monitoring usage of an image output device, the method comprising:

receiving, from the image output device, a first message transmitted using an Internet application-layer protocol over a network, the received message including a job identifier identifying a job and resource usage information for the job, wherein the job was processed by the image output device for a registered user of the image output device;

obtaining, based on the resource usage information and usage information of the registered user stored in a memory, a total resource usage of the registered user;

determining whether the obtained total resource usage of the registered user reaches a predetermined threshold; and

transmitting a second message over the network to a predetermined destination, when it is determined in the determining step that the obtained total resource usage of the registered user reaches the predetermined threshold.

8. The computer-readable medium of claim **7**, wherein the image output device is one of a copier and a printer.

9. The computer-readable medium of claim **7**, the method further comprising:

obtaining a device identifier of the image output device;

obtaining model information of the image output device; and

obtaining device type information of the image output device.

10. The method of claim **1**, wherein the job identifier identifies a print job.

11. The method of claim **1**, wherein the receiving step comprises receiving a number of pages in the job as the resource usage information.

12. The method of claim **1**, wherein the transmitting step further comprises transmitting, to the predetermined destination, a warning message as the second message, the warning message including the obtained total resource usage, when it is determined that the obtained total resource usage reaches the predetermined threshold.

13. The method of claim **1**, further comprising:

obtaining, from the received message, the job identifier and the resource usage information.

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